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THE

ASSURANCE

MAGAZINE.

VOL. I.

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PREFACE.

At the close of the first volume of the *Assurance Magazine*, the Editors pause to express their thanks to the many friends who have kindly contributed to its pages, and who have still more kindly been at the pains to exert their influence for the extension of its circulation.

This needful support has been the more grateful, inasmuch as it has shown not only that the objects with which the Magazine was established are generally appreciated, but that the conduct of it with a view to the attainment of those objects has been thus far approved.

Under such auspices, the Editors cheerfully resume their labours, resolved to let no means escape them which may be calculated to advance the character of the undertaking, or to increase the utility of it.

London, 1851.

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THE

ASSURANCE MAGAZINE.

Memoir of the early History of Auxiliary Tables for the Computation of Life Contingencies. By Frederick Hendriks, Esq., Actuary of the Globe Insurance Company.

As nearly all those readers whom the subject-matter of the following pages is likely to interest, are already fully acquainted with the nature and acknowledged utility of the *Commutation Method*, or arrangement of the preparatory Tables for Annuity and Assurance calculations into certain forms called the D,N,S,M, and R columns; it will, therefore, be unnecessary to enlarge on those points; and the facts to be presently adduced will have reference simply to the early history of that system of computation, or, more strictly, to the date when, and the person by whom, it was first *really* promulgated. In bringing such facts forward, it is requisite to disclaim the remotest intention of urging that full merit is not likewise due to those English writers who have either foreshadowed or extended the method in this country, and who, although *not* its *first* discoverers, were undoubtedly its improvers.

The method was arrived at *separately* by English and by German authors, but the priority in the respective dates will be seen fairly to belong to the *latter*.

The circumstances to be brought forward in support of this view appear to have hitherto escaped any notice in England. There can scarcely be a doubt that when the late Mr. Francis Baily* drew up his well-known Memoir on Barrett's Formulæ, which was read to the Royal Society in June, 1812, his practical mind, and honourable endeavours to prevent, as he says, "Mr. Barrett's astonishing labours sinking into oblivion," offered a guarantee of his being perfectly unaware that formulæ, applicable to the same purposes, and in a more complete form, had been published (though *not* in England) some 27 years *previously;* otherwise it may be justly presumed that he would not have characterised Barrett's invention as an entirely new one, or its principles as "opening a *new* and a wide field to the analyst," without adding parenthetically—"at least new in England." (Note A, page 15.)

Mr. Barrett's unsuccessful attempt to publish his Life Annuity Tables, dates from 1811, and Mr. Baily's letter to him of the 17th June of that year is printed in the proposals for publication. Baily mentions that 25 years was the extent of time Barrett had devoted to the preparation of those Tables. This would bring their first conception to about the date of 1786.

The method was made public in England by Mr. Baily's "Appendix to the Doctrine of Life Annuities and Assurances," printed in 1813; whilst in Germany it had been published in a far more advanced form so far back as the year 1785, the date of the following work:—"Einleitung zur Berechnung der Leibrenten und Anwartschaften die

---

* Since President of the Royal Astronomical Society.

vom Leben und Tode einer oder mehrerer Personen abhangen mit Tabellen zum practischen Gebrauch, von Johann Nicolaus Tetens, Professor der Philosophie und Mathematik zu Kiel." Leipzig: bei Weidmanns Erben und Reich, 1785.

The above title is as follows in English:—Introduction to the computation of Life Annuities and Reversions which depend on the life and death of one or more persons, with Tables for practical use,by John Nicholas Tetens, Professor of Philosophy and Mathematics at Kiel." Leipsic: Weidmann's Heirs, and Reich, 1785.

It will be preferable to append in a note, instead of inserting here, some particulars as to who and what the learned Professor was; (see Note 1;) and before giving translations of such portions of his work as bear on the subject under consideration, it will be interesting to remark that he commences his somewhat lengthy Preface by observing, that on account of the changes that had occurred in the Calemberg Widows' Fund, it fell to his duty to make himself acquainted with the branch of arithmetic developed in his "Introduction," when noticing that the various questions which arose in that occupation concerning the applicability of the general Tables of Mortality, and respecting the greatness of the risk of the Fund, and other enquiries, were of much importance; and finding these nowhere cleared up, in pursuing his investigations many other results of consequence were arrived at, and they suggested the idea of an original introduction in which he could add to what was known on the subject, such particulars as he thought "most concise and to the purpose."

The changes in the Calemberg Widows' Fund, which Tetens refers to as the cause of his work, are thus mentioned in the communication from Mr. Oeder, of Oldenburgh, which Dr. Price inserted in his work on Life Annuities (see 1st vol. page 132, 6th Edition), where, after noticing the case of the Bremen Institution, which promised Annuities to widows for a payment on admission of a sum equal to one yearly payment of the Annuity purchased, and an annual contribution during marriage of 15 per cent., or a little less than one-seventh of the Annuity, he goes on to say:—

"The States of the Duchy of Calemberg, of which Hanover is the capital, established in 1767 a like scheme, but on terms still more deficient; for, though it differed from the two former schemes in paying a regard to the ages of married persons; yet, notwithstanding several augmentations, the contributions required by it did not, two years ago, come up to half the value of the Annuities. Great numbers, influenced probably by the lowness of the terms and the authority of the States, have been induced to encourage this institution. In 1779 it had Annuities to pay to 600 widows, and consisted of no less than 3800 members or subscribers, whose widows would be entitled to Annuities. In consequence of a rapid increase, its insufficiency was not then become palpable enough to force either a dissolution or a timely and effectual reformation. It was, therefore, likely to lay the foundation of great confusion and distress."

From the preceding extracts it will be seen that these "foreign bubbles" (as Dr. Price terms them) gave rise to the work of Professor Tetens, and the coincidence with the motives assigned by Mr. Baily, in introducing Barrett's Formulæ is somewhat remarkable. The following are Baily's prefatory remarks:—

"Nothing, perhaps, tended so much to destroy the numerous *Bubble Societies* which sprang up about forty years ago; nothing, probably, opened so effectually the eyes of the public with respect to their delusive schemes, as the publication of more correct and comprehensive Tables of the Values of Life Annuities, whereby the true value which ought to be given in such cases, was more accurately determined. And, as one improvement in science generally leads on to another, this naturally opened the way to a more complete and comprehensive investigation of the subject; so that, at the present day, a new, a distinct, and an interesting branch of analysis has arisen, which was unknown to mathematicians of a former period."

Tetens gives in his Preface a condensed view of the researches in the Theory of Life Annuities made by Dr. Halley, De Moivre, and others. (Note No. 2.) The works of Simpson he speaks of with much praise, and then introduces his own contributions to the subject in the following terms:—

"Of the more recent British authors on this matter only Morgan and Price have come to my knowledge, as having produced anything excellent or original. In the general theory both agree with Simpson. Morgan has indicated a double method of computing Annuities, which has, in all respects, much value. Dr. Price, who, with justice, much recommends it, seems, however, to ascribe to it somewhat too great pre-eminence. *I have not found it so easy or short as not to have had reasons for devising yet another, and for preferring this latter method.* One can compare them and judge.

"Dr. Price has made many original remarks of consequence in practice, especially in the fourth edition of his 'Observations on Reversionary Payments,' in two volumes, 1783.

"In the year 1752, when the above-mentioned '*Select Exercises*' of Simpson appeared, it seemed that in Germany one was not yet so much as acquainted with the *elements* of these calculations. We had Widow's, Orphans', and Dead People's Funds; but of what description? All projected at random, or upon an approximative, but in these cases generally deceptive calculation, without just principles, or upon such as have also had the result, which the like ill-calculated projects generally give rise to. Still, we do not need to blush on this account, for such practical follies have likewise occurred among our neighbours on the other side of the sea. They have Provident Associations, which are nearly as faulty as the most faulty of ours, and which are of more recent date than the writings from which they could instruct themselves of a better administration. Reason in books is also with them; not reason in practice. But what might surprise is this, that we in Germany remain behind hand in the science itself; we who are, moreover, so very active in transplanting among us new foreign discovered knowledge. In 1706 *Euler* first propounded his method of computing Widows' Annuities. It was considered of importance as a new discovery, and certainly the illustrious man had found it out of his own accord, but it had no quality less than that of novelty: it was the same method of computing according to the Mortality Tables, as had long been known to the English. (Note No. 3.) From that time forward we have made it a study. Messrs. Seyberth, Kritter, Lambert, Fuss, Oeder, Lous, Bugge, and Florencourt, have laboured therein with intelligence and advantage. We may say that we are equal to the Britons in those branches of it which immediately appertain to our requirement, and, if one looks at it strictly, we excel them in some one or other. But if we wish to be just, we must admit that Simpson had gleaned in no German book, and also that much might be learnt from *Price*, after one has likewise mastered all that has been written on the subject by our countrymen.

"This position of the science, and of so useful a science, was the circumstance which chiefly incited me to pursue it further than I at first intended, and further, perhaps, than the business which led me to it would have required for itself alone.

"The Britons have long been our teachers; or, properly, they could have been so. May not the German, then, embrace the resolution, so to bring it about, that in their turn they can learn something from us, if they will. I would fain incite and give opportunity to that purpose." (Note B, see page 19.)

This praiseworthy sentiment of Professor Tetens was expressed, however, at a period when a long course of political troubles was about to prevent any extended communication of ideas between Great Britain and Germany reciprocally, and to postpone till more peaceful days, the establishment on the continent of the various Provident Annuity and Insurance Institutions, which have since been founded on correct principles, and to the appreciation of which, and as offering valuable information, the work of Professor Tetens had long been available.

The following *translated extracts*, with occasional remarks and notes, have now to be submitted, and the reader is requested, after their perusal, to ask himself the question, Whether, reviewing the circumstances adduced, must it not be concluded that Tetens was the first discoverer of the modern system of arranging Life Tables? If the present memoir be the means of satisfying its readers of that fact, then its object will have been fully carried out, and the care bestowed on its compilation amply recompensed.

Translated Extracts, with remarks and notes:

"*Practical method of computing the mean Duration of Life and Life Annuities according to any given Table of Mortality.*

"The methods of computation hitherto applicable to these subjects either only lead to *nearly correct values*, being *Methods of Approximation*, or else they give such values quite correctly. Recourse was had to the former because the latter appeared diffuse and laborious. But they are not so, when one is but provided with the auxiliary Tables which appertain to the calculation of interest.

"By means of a new Auxiliary Table which can be made in accordance with the Table of Mortality by which it is to be reckoned, and at the rate of interest proposed for its foundation, the whole labour, as well for Life Annuities as for the mean duration of life, may be reduced to one division. The preparation of that table requires nothing more than an easy addition when regard is had to the *Duration of Life* only, but demands somewhat more trouble if it be extended to the *calculation of Life Annuities*,—it would not therefore be desirable to make it for one single Annuity of the kind. But then it gives simultaneously all values of Life Annuities as well as all durations for every age at once. I will here annex it as applied to Suss-

milch's Table of Mortality.—(Note 4, p. 5). It is the model for others of the like description."—(Note 5, p. 15.)

TABLE T. (1).

A. Age.	B. Living according to Sussmilch.	C. The Numbers in B discounted for the years of the age, r being $= 1·04$.	D. Sum of the Numbers in B added upward from beneath.	E. Sum of the Numbers in C added upward from beneath.	A. Age.	B. Living according to Sussmilch.	C. The Numbers in B. discounted for the years of the age, r being $= 1·04$.	D. Sum of the Numbers in B added upward from beneath.	E. Sum of the Numbers in C. added upward from beneath.
0	1000	1000	28988	12431·48					
1	750	721·15	27988	11431·48	51	291	39·37	4934	455·74
2	661	611·13	27238	10710·33	52	282	36·69	4643	416·37
3	618	549·40	26577	10099·20	53	273	34·15	4361	379·68
4	593	560·90	25959	9549·80	54	264	31·75	4088	345·53
5	579	475·90	25366	9042·90	55	255	29·49	3824	313·78
6	567	448·11	24787	8567·00	56	246	27·36	3569	284·29
7	556	422·51	24220	8118·89	57	237	25·34	3323	256·93
8	547	399·69	23664	7696·38	58	228	23·44	3086	231·59
9	539	378·69	23117	7296·69	59	219	21·65	2858	208·15
10	532	359·40	22578	6918·00	60	210	19·96	2639	186·60
11	527	342·33	22046	6558·60	61	201	18·37	2429	166·54
12	523	326·66	21519	6216·27	62	192	16·87	2228	148·17
13	519	311·70	20996	5889·61	63	182	15·38	2036	131·30
14	515	297·40	20477	5577·91	64	172	13·98	1854	115·92
15	511	283·74	19962	5280·51	65	162	12·66	1682	101·94
16	507	270·69	19451	4996·77	66	152	11·42	1520	89·28
17	503	258·23	18944	4726·08	67	142	10·26	1368	77·86
18	499	246·32	18441	4467·85	68	132	9·17	1226	67·60
19	495	234·95	17942	4221·53	69	122	8·15	1094	58·43
20	491	224·09	17447	3986·58	70	112	7·19	972	50·28
21	486	213·27	16956	3762·49	71	103	6·36	860	43·09
22	481	202·96	16470	3549·22	72	94	5·58	757	36·73
23	476	193·13	15989	3346·26	73	85	4·85	663	31·15
24	471	183·75	15513	3153·13	74	77	4·23	578	26·30
25	466	174·80	15042	2969·38	75	69	3·64	501	22·07
26	461	166·28	14576	2791·58	76	62	3·15	432	18·43
27	456	158·15	14115	2628·30	77	55	2·68	370	15·28
28	451	150·40	13659	2470·15	78	49	2·30	315	12·60
29	445	142·69	13208	2319·75	79	43	1·94	266	10·30
30	439	135·35	12763	2177·06	80	37	1·61	223	8·36
31	433	128·37	12324	2041·71	81	32	1·33	186	6·75
32	427	121·72	11891	1913·34	82	28	1·12	154	5·42
33	421	115·39	11464	1791·62	83	24	0·93	126	4·30
34	415	109·37	11043	1676·23	84	20	0·74	102	3·37
35	409	103·65	10628	1566·86	85	17	0·61	82	2·63
36	402	97·95	10219	1463·21	86	14	0·48	65	2·02
37	395	92·55	9817	1365·26	87	12	0·40	51	1·54
38	388	87·41	9422	1272·71	88	10	0·32	39	1·14
39	381	82·53	9034	1185·30	89	8	0·24	29	0·82
40	374	77·90	8653	1102·77	90	6	0·18	21	0·58
41	367	73·50	8279	1024·87	91	5	0·14	15	0·40
42	360	69·33	7912	951·37	92	4	0·11	10	0·26
43	353	65·36	7552	882·04	93	3	0·08	6	0·15
44	346	61·60	7199	816·68	94	2	0·05	3	0·07
45	339	58·04	6853	755·08	95	1	0·02	1	0·02
46	332	54·65	6514	697·04	96				
47	324	51·28	6182	642·39					
48	316	48·09	5858	591·11					
49	308	45·07	5542	543·02					
50	300	42·21	5234	497·95					

" This Table constructed, nothing more is requisite for the computation of the mean duration of life, than that when the age of a person is a, the number in the column D against the next following year $a + 1$, be divided by the number, in column B against the given age, and ½ added thereto.

" The number in the column D against the year $a + 1$, including the sum of the numbers of living in B, from the year $a + 1$ upward, the latter included, to the end of the Table. Let A be the number at which we set out, or the number living at the given age, which stands against the year of this age in column B, then the number in column D against the next following year is—

$$= \overset{1}{-}A + \overset{2}{-}A + + \overset{x}{-}A$$

This being then divided by A and ½ added, gives—

$$\frac{\overset{1}{-}A + \overset{2}{-}A + + \overset{x}{-}A}{A} + \tfrac{1}{2} = E\,\overline{a}$$

" Example.—Let the given age be 15 years, then $A = 511$. The number standing under D, against the 16th year, is 19451. Now,

$$\frac{19451}{511} + \frac{1}{2} \text{ is } = 38{\cdot}06 + 0{\cdot}5 = 38{\cdot}56$$

This is the mean duration of life.

" To find the value of a *Life Annuity* of 1, that is for the *whole year*, in which the intermediate periods are not reckoned, and the rent itself is payable always at the end of the year, one divides the number from column E, which stands against the age with 1 year added, by the number in column C against the given age itself.

" EXAMPLE.—Let the given age be 20 years, then the number 3762·49 stands in the column E against 21 years, and 224·09 in the column C against 20 years. Now, $\frac{3762{\cdot}49}{224{\cdot}09} = 16{\cdot}79$. This is the net present value of a Life Rent of 1 for a person aged 20 years, when the interest of money is reckoned at 4 per cent.

" The values found are correct only to two decimal ciphers when the numbers in column B are only taken to so many places. Should a table be prepared with nicety, then one must extend it further, up to 5 figures. In the preceding example one finds by the numbers employed, $\lambda\ \overline{20} = 16{\cdot}7901$; but the more exact required value is 16·7905.—(Note 6, see page 15).

" Moreover it becomes evident from the arrangement of the Auxiliary Table itself, that the method of computation is accurate. The number against the year 20 in column C, viz.: 224·09 is the number of living in that year in column B (491), discounted back for 20 years, expressed thus $\frac{491}{r^{20}}$

The next numbers of the same column C are the following numbers of the living discounted.

$$\frac{\overset{1}{-}A}{r^{20+1}} \qquad \frac{\overset{2}{-}A}{r^{20+2}} \qquad \frac{\overset{3}{-}A}{r^{20+3}}$$

and so farther, where A again represents the number of the living at commencement of the age of 20 years, $\overset{1}{-}\mathrm{A}$ that for the first following year, $\overset{2}{-}\mathrm{A}$ for the second, and so on. But now the number in column E, at 21, gives the sum

$$\frac{\overset{1}{-}\mathrm{A}}{r^{20+1}} + \frac{\overset{2}{-}\mathrm{A}}{r^{20+2}} + + \frac{\overset{x}{-}\mathrm{A}}{r^{20+x}}$$

therefore this number divided by the number of column C, against 20 years, is equivalent to

$$\frac{1}{\mathrm{A} : r^{20}} \cdot \left(\frac{\overset{1}{-}\mathrm{A}}{r^{20+1}} + \frac{\overset{2}{-}\mathrm{A}}{r^{20+2}} + + \frac{\overset{x}{-}\mathrm{A}}{r^{20+x}}\right)$$

and when instead of 20, *a* is substituted generally for any given age, it is equal to

$$\frac{1}{\mathrm{A} : r^{a}} \cdot \left(\frac{\overset{1}{-}\mathrm{A}}{r^{a+1}} + \frac{\overset{2}{-}\mathrm{A}}{r^{a+2}} + + \frac{\overset{x}{-}\mathrm{A}}{r^{a+x}}\right)$$

$$= \frac{1}{\mathrm{A}} \cdot \left(\frac{\overset{1}{-}\mathrm{A}}{r} + \frac{\overset{2}{-}\mathrm{A}}{r^{2}} + + \frac{\overset{x}{-}\mathrm{A}}{r^{x}}\right)$$

= the present worth of the Life Annuity at the age a, $= \lambda\,\overline{a}$.

"I consider this method the most excellent of all, especially because one may also use the so prepared auxiliary tables with much advantage in the valuation of Joint Life Annuities, as I will show hereafter. Besides, as column C gives some trouble, one can deviate from it in regard to single life annuities by an easier arrangement.

"1st—Instead of the discounted numbers of the living, one takes the similarly *discounted yearly decrements* and places these in column C, and their sums from beneath upward in column E. The Decrements are much smaller numbers, therefore the discounting succeeds more easily and rapidly.

"2nd—If the given age be *a*, then one divides the number against *a* in column E, by the original number A.

"3rd—This quotient being again multiplied by r^{a}, one thus arrives at *the present value of the sum of* 1 *payable at the decease of a person aged a.* The 21st Table contains these values according to Sussmilch's Table, and at the rate of interest $r = 1{\cdot}04$.

"4th—This product deducted from 1 and the remainder multipied by the *present value of the perpetuity* gives the value of the Life Annuity of 1, whence its worth is easily ascertained for any other amount of yearly rent.

"I will not therefore insert such a Table here myself. Its construction is easily intelligible. One sees that by this plan the labour of the arrangement is shortened, but then again more computation is wanted than by the before described process. However, such methods are very serviceable when we only seek for one or more Life Annuities by a certain Table of Mortality, without requiring to have them all.

" If the preceding plan be used, then the sum at the age *a*, which one takes from the table (calling it *S*)

$$= \frac{\Delta A}{r^{a}} + \frac{\Delta^{\overset{1}{-}}A}{r^{a+1}} + + \frac{\Delta^{\overset{x}{-}}A}{r^{a+x}} \cdot$$

ΔA, $\Delta^{\overset{1}{-}}A$, $\Delta^{\overset{x}{-}}A$, being the decrements following each other of the initial number A at age *a*, each discounted back to the commencement of the life. Thence is

$$\frac{r^{a-1}S}{A} = \frac{1}{A} \cdot \left(\frac{\Delta A}{r} + \frac{\Delta^{\overset{1}{-}}A}{r^{2}} + + \frac{\Delta^{\overset{x}{-}}A}{r^{x}}\right)$$

This last quantity being again multiplied by *r*, is *the present value of a sum of* 1 *payable at the death of a person of the given age* a (*the worth of an inheritance of* 1 *which is to be received at the death of the person.*) This value will be used in many problems, therefore a special table for it was necessary. (See Note 7, page 16.)

Calling this value T then $\lambda\,\overline{a}$ is $= p\,(1 - \mathrm{T})$

Let the given age be 40 years; then by the 21st Table the value $\mathrm{T} = 0{\cdot}4737$, and, because by the same rate of interest $r = 1.04$, p is $= 25$,—then we have $(1-0{\cdot}4737) \times 25 = 13.1575$ for the Life Annuity or $\lambda\,\overline{40}$.

When the values of T have not already been computed from the values of the Life Annuities, in that case one could obtain the latter from the former. The English call the Life Annuity *the value of the life (Der Werth des Lebens).* The said values T might according to this analogy be termed *values of the death.* But they have already other names, and these are willingly retained in order to avoid the overstrained affected expressions of 'finding the value of the life from the value of the death' and the like.

" *Third Method of calculating Life Annuities.*

" The arrangement necessary in the following method is still easier:—

" 1. Instead of the *yearly decrements* their differences are taken, and each of these discounted back to the commencement of the age as before. Rejecting the lives under 10 years of age, as their Life Annuities seldom come into notice, then by Sussmilch's Table, the first *difference of the decrements* $5 - 4 = 1 = \Delta A - \Delta^{\overset{1}{-}}A$ and the following ones up to the 20th year are all $= 0$, and all the subsequent ones either 1 or 0. Consequently the column of discounted numbers, which hitherto has required the most computation, can be transcribed merely from the Table of discounted sums. (Table No. 2 at end of the work.)

" 2. One sums these *discounted differences* from beneath upward. But here it is to be noticed, that where the following *decrement* is greater than the one preceding, when $\Delta^{\overset{n+1}{-}}A \triangleright \Delta^{\overset{n}{-}}A$, then will the *difference* $\Delta^{\overset{n}{-}}A - \Delta^{\overset{n+1}{-}}A$, and also the discounted difference be *negative*, and must therefore be *deducted* from the described *summation* from beneath upward.

"3. To use these sums for any other age *e. g.* 20 years, the sum belonging to 20 years must again be multiplied by r^{20}. Let the so found sum of the differences for a commencing number be represented by N;

"4. One subtracts the number N from the first decrement of the commencing number A, that is from ΔA, and one multiplies the remainder by $\frac{rp}{A}$. This is also again the value of the reversion. (Note 8, page 17.) Therefore,

"5. That value itself being deducted from unity, and multiplied by the present value of the *perpetuity*, gives the value of the *Life Annuity* of 1. This is expressed in Symbols

$$\lambda\,\overline{a} = \left(1 - rp\,\frac{(\Delta A - N)}{A}\right) p.$$

SECTION 61.

"We can still further take the *differences of the differences* instead of the differences themselves, discount them back in the same manner, as before, and sum the discounted numbers backward from the end. With Sussmilch's Table of Mortality nothing is gained thereby, nor have we smaller numbers, or fewer to discount, than when the differences themselves are used. With other Tables it may be the reverse. The computation then to be made is, it is true, somewhat more contracted, but that is unimportant. In the Appendix I have treated of this more at length.

"There will also be found there another method of obtaining the value of Life Annuities by means of the *decrements* and values of *temporary Annuities certain.*" (Zeitrenten.)

Extract from Appendix above referred to (page 157):—

"Another easier method of obtaining the value of Life Annuities is the following, but it does not present so convenient a general arrangement at one age as at another. One multiplies the present values of the temporary Annuities following each other in the 3rd Table, $\int\frac{1}{r}$, $\int\frac{1}{r^2}$, $\int\frac{1}{r^3}$, and so on, up to $\int\frac{1}{r^{x-1}}$, when x is the *complement of the life*, (Altersergänzung) each into the decrements belonging thereto, which are but small numbers, for example, $\int\frac{1}{r}$ is multiplied into $\Delta\overset{1}{-}A$, that is, into the decrement of the *second year*. Further $\int\frac{1}{r^2}$ into $\Delta\overset{2}{-}A$, and so forth.

$$\therefore\ \Delta\overset{1}{-}A\int\frac{1}{r} + \Delta\overset{2}{-}A\int\frac{1}{r^2} + \Delta\overset{3}{-}A\int\frac{1}{r^3} + +$$

$$\Delta\overset{x-1}{\cdot}A\int\frac{1}{r^{x-1}} = A\lambda\overline{a}$$

(See note 9, page 18.)

SECTION 62.

In reverting to his own system (Table T (1) of this paper), Tetens gives a detailed account of "Morgan's Method of Computing Life Annuities by a *double reckoning*, of which one is at the same time the proof of the other." Our author then adds that the reason of his quoting such method is that Dr. Price prefers it to every other; but "wherefore" "he sees no just ground." He subsequently, however, recommends Morgan's method when a check is desired upon the figures in his new Table. He compares the two systems thus (page 102):—"This method (Morgan's) has decidedly its value, but I imagine, however, that in conciseness (Kürze) it is not to be compared with the one which I have before indicated." Tetens goes on to say that the preparation of his own Auxiliary Table (No. T (1) just quoted) "requires absolutely no division, but only multiplication and addition, when one has already the discounted numbers."

The Table of discounted numbers here means a Table of the present value of one receivable at the end of any number of years at a given rate of interest. (Table 2 of Smart's work.) Tetens notices that Morgan also publishes those discounted values. Morgan's Table is, however, for the rate of 4 per cent. only, whilst that of Tetens is also for 3, 5, and 6 per cent., being a Table computed for his work by Herr von Drateln, and the values are worked out to 10 places of decimals, being four places more than in Morgan's, and two more than in Smart's Table.

SECTION 85.

"By means of such an Auxiliary Table as the preceding one (§ 56) for the computation of Life Annuities, one finds the *Deferred Life Annuities* (aufgeschobene Leibrenten) in a similar manner by one division. The sum of the discounted numbers of living in column E, against the year $a + n + 1$ has to be divided by the discounted number of living, standing in column C against the year a, and the quotient is what is sought. . . . . When $a = 20$ and $n = 16$, then there stands against the year $a + n + 1 = 37$, in the column E, 1365·26 and against 20 years in the column C, 224·09. Then $\frac{1365.26}{224.09} = 6.093$ is the result."

SECTION 117.

"Method of computing the average duration of the joint lives of two persons.

"I will here insert the Auxiliary Table which I have already mentioned (chap. 1, § 89). It serves to compute with facility the value of a Life Annuity, increasing according to the natural order of numbers, also the average duration of *joint lives*, and, in the following section, the *values of Annuities on joint lives.*"

TABLE T (2)

A. Year.	B. Decrements.	C. Differences of the Decrements.	D. Sums of the Sums of the living.	E. Sums of the Sums of the discounted Numbers of living.	A. Year.	B. Decrements.	C. Differences of the Decrements.	D. Sums of the Sums of the living.	E. Sums of the Sums of the discounted Numbers of living.
0	250	+161	857202	210074·50					
1	89	+ 46	827219	197643·02	51	9	0	59589	4339·76
2	43	+ 18	799231	186211 54	52	9	0	54655	3884·02
3	25	+ 11	771993	175501·21	53	9	0	50012	3467·65
4	14	+ 2	745416	165402·01	54	9	0	45651	3087·97
5	12	+ 1	719457	155852·21	55	9	0	41563	2742·44
6	11	+ 2	694091	146909·31	56	9	0	37739	2428·66
7	9	+ 1	669304	138242·31	57	9	0	34170	2144·37
8	8	+ 1	645084	130123·42	58	9	0	30847	1887·44
9	7	+ 2	621420	122427·04	59	9	0	27761	1655·85
10	5	+ 1	598303	115130·35	60	9	0	24903	1447·70
11	4	0	575725	108212·35	61	9	— 1	22264	1261·10
12	4	0	553679	101653·78	62	10	0	19835	1094·56
13	4	0	532160	95437·48	63	10	0	17607	946 39
14	4	0	511164	89547·87	64	10	0	15571	815·69
15	4	0	490687	83969 96	65	10	0	13717	699·17
16	4	0	470725	78689·45	66	10	0	12035	597·23
17	4	0	451274	73692·68	67	10	0	10515	507·95
18	4	0	432330	68966·60	68	10	0	9147	430·09
19	4	— 1	412889	64498·75	69	10	0	7921	362·49
20	5	0	395947	60277·22	70	9	+ 1	6827	304·06
21	5	0	378500	56290·64	71	9	0	5855	253·78
22	5	0	361544	52228·15	72	9	+ 1	4995	210·69
23	5	0	345074	48978·93	73	8	0	4238	173·96
24	5	0	329085	45632.67	74	8	+ 1	3575	142·81
25	5	0	313572	42479·54	75	7	0	2997	116·51
26	5	0	298530	39610·16	76	7	+ 1	2496	94·44
27	5	— 1	283954	36715·58	77	6	0	2064	76·01
28	6	0	269839	34087 28	78	6	0	1694	60·73
29	6	0	256180	31617·13	79	6	+ 1	1379	48·13
30	6	0	242972	29297·38	80	5	+ 1	1113	37·83
31	6	0	230209	27120·82	81	4	0	890	29·47
32	6	0	218885	25078·61	82	4	0	704	22·72
33	6	0	206994	23165·27	83	4	+ 1	550	17·30
34	6	— 1	195530	21373·65	84	3	0	424	13·00
35	7	0	184487	19697·42	85	3	+ 1	322	9·63
36	7	0	173859	18130.56	86	2	0	240	7·00
37	7	0	163640	16667·35	87	2	0	175	4·98
38	7	0	153823	15302·09	88	2	0	124	3·44
39	7	0	144401	14029·38	89	2	+ 1	85	2·30
40	7	0	135367	12844·08	90	1	0	56	1·48
41	7	0	126714	11741·31	91	1	0	35	0·90
42	7	0	118435	10716·44	92	1	0	20	0·50
43	7	0	110523	9765·07	93	1	0	10	0·24
44	7	0	102971	8883·03	94	1	0	4	0·09
45	7	— 1	95772	8066·35	95	1	+ 1	1	0·02
46	8	0	88919	7311·27	96	0	0	0	
47	8	0	82405	6614·23					
48	8	0	76228	5971·84					
49	8	— 1	70365	5380·73					
50	9	0	64828	4837·71					

SECTION 118.

"This Table is only, however, made according to Sussmilch's Table of Mortality, but can be easily constructed according to any other order of dying. It requires the before given Table for single lives (§ 56). From the latter it can be prepared in less than an hour's time. It consists entirely in an easy addition of numbers. The whole work which can be called in any way laborious, is, that one must compute in the first Table for single lives the *discounted numbers of living* (being the numbers for column E). All the rest is then as good as completed.

"The Table before us contains in column C, the *difference of the* decrements in B (what A and B. are one perceives at a glance). The difference of one decrement from the next following is placed at the side of the former, and this is *positive* when the following decrement is smaller, and *negative* in the contrary case.

"The column D of this Table contains the sum of the numbers in column D of the former Table. The sums of the living for every year are summed anew from beneath upward, so that *the number, which stands against any year, is the sum of all the numbers which stand in the former Table against the same year, and which follow from it to the end of the Table.* There stands in the present Table against the 15th year the number 490687. This is the sum of 19962 against the 15th year in the former Table, and all following numbers together.

The *sums of the living* in the former table for a certain age *a* are $\overset{1}{-}\mathrm{A} + \overset{2}{-}\mathrm{A} + \overset{3}{-}\mathrm{A} + + \overset{x}{-}\mathrm{A}$. If this series be symbolized by $\int \overset{1}{-}\mathrm{A}$ then the number in the present Table, column D, for the same year, can be distinguished by $\mathrm{S}.\int \frac{1}{\mathrm{A}}$. For it contains

$$\left(\overset{1}{-}\mathrm{A} + \overset{2}{-}\mathrm{A} + \overset{3}{-}\mathrm{A} + +\right) + \left(\overset{2}{-}\mathrm{A} + \overset{3}{-}\mathrm{A} + +\right) + \left(\overset{3}{-}\mathrm{A} + +\right) + +$$

$$= \int \overset{1}{-}\mathrm{A} + \int \overset{2}{-}\mathrm{A} + \int \overset{3}{-}\mathrm{A} + + \; = \; \mathrm{S}.\int \overset{1}{-}\mathrm{A}$$

"Thus far the Table extends to the computation of the *duration of joint lives.* The last column E appertains to the calculation of Annuities which are payable so long as the joint lives endure. This column E is in like manner constructed by summation of the column E of the former Table, as the numbers of such latter Table from the discounted numbers of living. When the series of *the discounted numbers of living* for a given age

$$= \frac{1}{r^{a}} \left(\frac{\overset{1}{-}\mathrm{A}}{r} + \frac{\overset{2}{-}\mathrm{A}}{r^{2}} + \frac{\overset{3}{-}\mathrm{A}}{r^{3}} + + \frac{\overset{x}{-}\mathrm{A}}{r^{x}}\right)$$

is represented by $\int \frac{\overset{1}{-}\mathrm{A}}{r^{a} + 1}$, then that is the number which stands in the former Table against the year *a*. The one, however, which stands in the present Table against *a* in the column E, is

$$= \frac{1}{r^{a}} \left(\frac{\overset{1}{-}\mathrm{A}}{r^{1}} + \frac{\overset{2}{-}\mathrm{A}}{r^{2}} + \frac{\overset{3}{-}\mathrm{A}}{r^{3}} + + \frac{\overset{x}{-}\mathrm{A}}{r^{x}}\right.$$

$$+ \frac{\overset{2}{-}\mathrm{A}}{r^{2}} + \frac{\overset{3}{-}\mathrm{A}}{r^{3}} + + \frac{\overset{x}{-}\mathrm{A}}{r^{x}}$$

$$+ \frac{\overset{3}{-}A}{r^{3}} + + \frac{\overset{x}{-}A}{r^{x}} + + \Big)$$

$$= S.\int \frac{\overset{1}{-}A}{r^{a} + 1}$$

"In using the last Table, one must have the columns B and C of the first at same time before one.—I feared that the Table might become too wide for the space of the page, otherwise I would again have here introduced those columns."

SECTION 119.

"From this Table may be *found by one division the values of Life Annuities increasing according to the natural order of numbers* $L\bar{a}$ (§ 76.)

"The number *at the age a* + 1 in *column E* must be divided by the *discounted number of living* in column C of the *first* Table. The quotient is the required value of the *increasing Life Annuity*. (§ 89.)

"For the quotient is—

$$= \frac{1}{r^{a}} \cdot \frac{1}{A : r^{a}} \cdot \left(\frac{\overset{1}{-}A}{r^{1}} + \frac{\overset{2}{-}A}{r^{2}} + + \frac{\overset{x}{-}A}{r^{x}} \right.$$

$$\left. + \frac{\overset{2}{-}A}{r^{2}} + + \frac{\overset{x}{-}A}{r^{x}} \right)$$

"For example—Let the given age be 20 years = *a*. The number standing against 21 years is 56290·64. The discounted number of living in the first Table is 224.09. Thence $\frac{56290.64}{224.09} = 251.64$. (Note 10, p. 19.) According to the hypothesis of equal decrements (gleichförmigen Absterben) the value was 248·805." (Chap. 1, § 79.)

Professor Tetens then gives some approximative and other rules for determining the average duration of joint lives, and the values of Annuities thereon, generally by addition and substraction of differences of which the Table last given is the element of foundation. It is to be remarked that the practical importance of preparing Joint Life Tables for every combination of ages was not of absolute necessity at the time when he wrote; moreover, his plan of obtaining values for joint lives was suggested by its applicability to the Sussmilch Table of Mortality, in which the differences from the ages of 10 to 96 were either 1 or 0.

The subject of this paper has now taken up more space than was at first intended, and, whilst apprehending that it may prove comparatively uninteresting to the general reader, yet to the actuary, or to any person to whom the progress of the theory of Life Contingencies carries either information or instruction, it is ventured to observe that the consideration of the early history of the theory of Life Contingencies, without reference to Professor Tetens' researches, which are here first introduced to his notice, would be, not only incomplete, but inconsistent with a correct view of the system in its whole history and practice.

June, 1850. F. H.

Note No. 1. (Page 2.)

Our available authorities respecting Johann Nicolaus Tetens are the "Encyclopädie der Deutschen Nationalliteratur" by Dr. O. L. B. Wolff, 7th volume. Leipzig, 1842, and the "Biographie Universelle," 45th volume. Paris, 1826.

Tetens was born September, 1737, at Tetensbüll, Eiderstädt, in the Duchy of Schleswig; he studied from 1755 to 1758 at Rostock and Copenhagen—was appointed in 1763 professor of Physics at Butzow, and occupied from 1765 to 1770 the post of Director of the Educational Establishment which he had newly organized there. In the year 1776 he was invited to Kiel and named to the Professorship of Philosophy and Mathematics in the University of that town. In 1789, he removed to Copenhagen, where he died 19th August, 1807, after having for nearly 20 years occupied some very honourable posts in the administration, as Assessor in the Financial College and Director of Revenue—next in 1791 as Danish State Counsellor and Deputy in the Financial College, and lastly as Privy Counsellor. From 1787, he was a Fellow of the Royal Danish Society.

His German writings are—

No. 1.—Von den vorzüglichsten Beweisen für das Dasein Gottes. Butzow and Wismar, 1761. "On the most prominent proofs of the existence of God."

No. 2.—Ueber den Ursprung der Sprache und Schrift. 8vo. Butzow and Wismar, 1772. "On the origin of Speech and of Writing."

No. 3.—Ueber die allgemeine speculative Philosophie. Butzow, 1775. "Upon general speculative philosophy."

No. 4.—Philosophische Versuche über die menschliche Natur und ihre Entwickelung. 2 vols. 8vo. Leipzig, 1777. "Philosophical Essay on Human Nature and its Development."

No. 5.—Gedanken über einige Ursachen, warum in der Metaphysik nur wenige ausgemachte Wahrheiten sind. Butzow, 1780. "Thoughts respecting some reasons why in Metaphysics there are but few determined truths."

No. 6.—Einleitung zur Berechnung der Leibrenten und Anwartschaften. 8vo. Leipzig, 1785. "Introduction to the Calculation of Life Annuities and Reversions." The second part, forming another volume of the same work, was published at Leipzig, 1786.

No. 7.—(written in French). Voyage sur les côtes de la Mer du Nord, pour y observer la construction des Digues. 8vo. Leipzig, 1788.

No. 8.—(written in French). Considerations sur les Droits réciproques des puissances belligérantes et des puissances neutres sur Mer. 8vo. Copenhagen, 1805.

No. 9.—Tetens also edited the following work in Latin. "Jens Kraftü prælectiones mechanicæ cum additamentis, latinè redditæ." 4to. Butzow, 1773.

Of the above, only Nos. 1 to 5 inclusive are mentioned by Wolff, and only Nos. 2, 3, 6, 7, 8, and 9 in the Biographie Universelle.

In the general catalogue of the British Museum Library we have only found one of the nine works, viz., No. 8 in the above list—"Considerations sur les Droits, &c."

The preceding account of Professor Tetens will be most appropriately concluded with the following remarks from the "Encyclopädie der Deutschen Nationalliteratur."—

"Tetens acquired for himself a celebrity especially by reason that in opposition to those of his time, he treated practical philosophy intelligibly to all, and knew how to bring it forward for that purpose in a clear and luminous manner."

Note No. 2. (Page 3.)

The following passage on the above subject is too remarkable to be omitted:

"These Annuity calculations have long been known in England. Halley, whom we have to thank for so many useful discoveries, came upon them already at the end of the preceding century. Huygens, before him, had taught how to compute probabilities. His principles Halley applied to the Registers of Death, when they were brought into order, and formed the method upon which to compute Life and Widows' Annuities. Some still call such method 'Halley's,' which is quite as reasonable as when one calls the well-known Theorem in Geometry, '*the* Pythagorean'; but some who thus named it, did so in lack of their own conviction of its accuracy, and wished thereby to set it up as such a method as might rest on Halley's reputation. But the reflection upon this is not unserviceable, that it is the identical method which exists in the nature of things, which follows necessarily from it, and therefore is one which every person, if he must not necessarily come upon it, will, however, arrive at it at first, and also in truth every one has come to, who has sought a method *upon right principles.*"

Tetens has *not* put the last three words in italics, but it is better to do so as they contain the pith of the whole paragraph.

Note 3. (Page 3.)

Vide "Milne's Treatise on the Valuation of Annuities and Assurances." Vol. 1, p. 16.

Note A. (Page 1.)

See also Note at page xxv, of "Baily's Doctrine of Life Annuities," particularly the concluding passage, viz.:—"Those useful and interesting parts of the science which relate to the subject of Reversions, Survivorships, and Assurances, together with their several applications to the various purposes of life do not enter into any of the foreign treatises which I have had an opportunity of seeing."

Note 4. (Page 5.)

This Table of Mortality was arranged by Baumann upon the average results of various observations (chiefly made in Brandenburg), and was first inserted in the "Gôttliche Ordnung" of Sussmilch. 4th Edition, 1775.

Note 5. (Page 5.)

It will lead to more clearness of perception of the extracts and notes, if the two tables of Tetens be symbolised thus:—the following by T (1), and the other, a few pages forward, by T (2). A distinction indeed is necessary, as there are columns in each table with like headings.

Note 6. (See Page 6.)

From the preceding example the arrangement will be easily perceived, where the numbers at ages of $a + 1$, $a + 2$, $a + 3$, &c., of columns E, of Tables T (1), and T (2), correspond with those at ages of a, $a + 1$, $a + 2$, &c. of modern notation; in which structural relation of the ordinary D and N columns, Tetens' arrangement is similar to that of Barrett, which is still preserved by Mr. Farr.

Tetens' remark on the calculation of his Table T (1) to a greater number of decimals, has induced us to check it in that manner between the ages of 95 and 90, which affords an opportunity of annexing the usual columns computed to the extended number of decimal places. Each of those columns will be presently referred to, and their enunciation in Professor Tetens' work briefly noticed. They are as follows:—

1st.—Column D of modern notation, $= l_a \cdot v^a$, being column C of Tetens' first Table T (1)—

95 — ·02408978
94 — ·05010674
93 — ·07816651
92 — ·10839089
91 — ·14090815
90 — ·17585337

2nd.—Column N of modern notation $= D_a + D_{a+1} + \cdots$ corresponding with N_{a-1} of the usual form of arrangement before described, and being column E of Tetens' first Table T (1)—

95 — ·02408978
94 — ·07419652
93 — ·15236303
92 — ·26075392
91 — ·40166207
90 — ·57751544

3rd.—Column S of modern notation $= N_a + N_{a+1} + \cdots$ corresponding with S_{a-1} of the usual form, and being column E of Tetens' Second Table T (2)

95 — ·02408978
94 — ·09828630
93 — ·25064933
92 — ·51140325
91 — ·91306532
90 — 1·49058076

4th.—Column C of modern notation $= d_a \cdot v^{a}$ and being also the *suggested* Table C of Tetens (see page 7), the reversion being considered as receivable *at decease* of the "*cestuy qui vie.*"

95 — ·02408978
94 — ·02505337
93 — ·02605550
92 — ·02709772
91 — ·02818163
90 — ·02930890

5th.—Column M of modern notation $= C_a + C_{a+1} + \cdots$ corresponding exactly with the usual form, and being the suggested Table S of Tetens (see page 8)

95 — ·02408978
94 — ·04914315
93 — ·07519865
92 — ·10229637
91 — ·13047800
90 — ·15978690

6th.—Column R, of modern notation $= M_a + M_{a+1} + \cdots$

95 — ·02408978
94 — ·07323293
93 — ·14843158
92 — ·25072795
91 — ·38120595
90 — ·54099285

Note No. 7. (See page 8).

Table XXI. is the one Tetens here refers to. In expressing a discounted value he always gives the elementary symbol $\frac{s}{r}$ equivalent in present notation to $\frac{s}{(1+i)^n}$ where i is the rate of interest and n, the number of years. By r, alone, in Tetens' work, is to be understood the amount of 1 at the end of 1 year at the given rate of interest. The C column which Tetens has just described is precisely the C column of modern notation for sums receivable *at decease*, and the column which Tetens calls S (id. est., the *summation* of C) is column M of the modern system.

As Tetens has not given an illustration in numbers, let his rule be applied to the following example :—

Required the value of 1, payable *at decease* of a person aged 90, taking the rate of Mortality from Sussmilch's Table and Interest at 4 per cent.

From the 5th column of the preceding note, Tetens' column S, at 90 would be ·1597869. The initial number A, at age a, is the number of living at age of 90 = 6 (see Table T (1)). Then, by the Rule,

$$6)\,\frac{\cdot 1597869}{\cdot 02663115} = \frac{1}{A}\left(\frac{\Delta A}{r} + \frac{\Delta \overset{1}{-} A}{r^{2}} + + \frac{\Delta \overset{x}{-} A}{r^{x}}\right)$$

$$\begin{array}{rrl}
 & \cdot 02663115 & \\
\overset{a}{r} \text{ inverted} = & 33911{\cdot}43 & = \text{amount of 1 in 90 years at 4 per cent.} \\
\cline{2-2}
 & 7989345 & \\
 & 1065246 & \\
 & 26631 & \\
 & 2663 & \\
 & 2397 & \\
 & 80 & \\
 & 8 & \\
\cline{2-2}
 & \cdot 9086370 & \text{Answer.}
\end{array}$$

On referring to Table XXI of Tetens' work the value at age of 90 is given at ·9086, the decimals not being carried further.

It is evident, therefore, that his formula for the youngest or any other life in the Table, viz.—

$$T = \frac{1}{A} \cdot \left(\frac{\Delta A}{r} + \frac{\Delta^{\overset{1}{-}} A}{r^{2}} + + \frac{\Delta^{\overset{x}{-}} A}{r^{x}} \right) \cdot r^{a}$$

is equivalent in modern notation to

$$\frac{d_a \cdot v^{a} + d_{a+1} \cdot v^{a+1} + + d_{a+x} \cdot v^{a+x}}{l_a \cdot v^{a}}$$

or

$$\frac{C_a + C_{a+1} + + C_{a+x}}{l_a \cdot v^{a}} = \frac{M}{D}$$

which will present a second proof of its accuracy, for $\frac{M_{90}}{D_{90}}$ is by the extended columns Nos. 5 and 1 in preceding note $= \frac{\cdot 15978690}{\cdot 17585337} = \cdot 908637$, as before.

Note 8, page 9.

Tetens has not given an example of this method, in numbers, but as it may be said of numerical, as well as of pictorial illustrations, that

> " Segniùs irritant animos demissa per aurem
> Quam quæ sunt oculis subjecta fidelibus,"

it will be of use to apply it to the same question as in the preceding note, viz.—to find the value of a Reversion to 1 receivable at the *decease* of a person aged 90, in which case the discounted differences will be as follows :—

$$\begin{array}{l r}
\Delta\ 95 - \Delta\ 96 = 1 \text{ which, multiplied by the present value of} & \\
\qquad\qquad\text{1, receivable at end of 96 years, becomes} & \cdot 02316325 \\
\Delta\ 94 - \Delta\ 95 = 0 & \cdots\cdots\cdots \\
\Delta\ 93 - \Delta\ 94 = 0 & \cdots\cdots\cdots \\
\Delta\ 92 - \Delta\ 93 = 0 & \cdots\cdots\cdots \\
\Delta\ 91 - \Delta\ 92 = 0 & \cdots\quad\cdot\cdot \\
\Delta\ 90 - \Delta\ 91 = 0 & \cdots\cdots\cdots \\
\cline{2-2}
\text{Sum of discounted differences} = & \cdot 02316325 \\
\left.\begin{array}{l}\text{Multiply the above by the} \\ \quad\text{amount of 1 in 90 years} \\ \quad = 34\,.\,11933 \quad . \quad . \quad .\end{array}\right\} & 33911{\cdot}43 \\
\cline{2-2}
 & 6948975 \\
 & 926530 \\
 & 23163 \\
 & 2316 \\
 & 2084 \\
 & 69 \\
 & 7 \\
\cline{2-2}
 & \cdot 7903144
\end{array}$$

Let the last product be represented as in the rule by N; it has then to be subtracted from Δ A or the first *decrement* at the age of A; ∴ in the present case

$$\begin{aligned} \Delta A &= 1\cdot \\ N &= 0\cdot7903144 \\ \hline \text{remainder} &= \cdot2096856 \end{aligned}$$

which has to be multiplied by $\frac{r\,p}{A}$ (or in modern notation,

$$\left.\frac{(1+i)\times p}{l_m}\right) = \frac{1.04 \times 25\cdot}{6} = \frac{26\cdot}{6} = 4\cdot3333$$

$$\begin{array}{r} \cdot2096856 \\ 33333\cdot4 \\ \hline 838742 \\ 62906 \\ 6291 \\ 629 \\ 63 \\ 6 \\ \hline \end{array}$$

T = ·908637 which is the value of the reversion, as before; and to obtain the *value of the annuity* at age of 90, using the formula $p\,(1 - T) = \lambda\,\overline{a}$, we have 25 (1 — ·908637) = 25 × ·091363 = 2·284075 —(See Tetens' 16th Table, page 571, the value to 4 places being there 2.2841).

Note 9. (See page 9.)

Let the last example of the preceding note, viz., the computation of the value of an Annuity of 1, at age of 90, per Sussmilch's Mortality and Interest at 4 per cent., be solved by Tetens' fifth method.

$$\begin{aligned}
\Delta\overset{1}{-}A \times \int \frac{1}{r} &= 1 \times 0\cdot9615885 = 0\cdot9615385 \\
\Delta\overset{2}{-}A \times \int \frac{1}{r^{2}} &= 1 \times 1\cdot8860947 = 1\cdot8860947 \\
\Delta\overset{3}{-}A \times \int \frac{1}{r^{3}} &= 1 \times 2\cdot7750910 = 2\cdot7750910 \\
\Delta\overset{4}{-}A \times \int \frac{1}{r^{4}} &= 1 \times 3\cdot6298952 = 3\cdot6298952 \\
\left(\begin{array}{c} \Delta\overset{5}{-}A \times \int \frac{1}{r^{5}} \\ = \Delta\overset{x-1}{-}A \times \int \frac{1}{r^{x-1}} \end{array}\right) &= 1 \times 4\cdot4518223 = 4\cdot4518223 \\
\hline
\text{Sum} &= 13\cdot7044417
\end{aligned}$$

This last sum is equal to A $\lambda\,\overline{a}$ of Tetens' formula, A being the number of living, which at the age of 90 is = 6, we have therefore for $\lambda\,\overline{a}$ or the value of the Annuity $\frac{13\cdot70444}{6} = 2\cdot28407$. Were it not that the subject has already taken so much space, it could be shown how the interesting formula just exemplified would clearly suggest a continuous arrangement similar to that of Mr. Thompson, described in the Post Magazine of 12th May, 1849, the only difference being, that in Tetens' formula the *decrements* and *not* the numbers living, form the element of operation.

Note 10. (See page 13.)

This formula of Tetens', viz., $\frac{E_{a+1}\text{ (of Table T (2))}}{\text{C (of Table T (1))}}$ is precisely $\frac{S_a}{D_a}$ of the modern system of notation, the E_{a+1} of Table T (2) being equivalent to S_a of the usual form.

Note B. (See Page 4).

Some notice of the authors cited by Tetens may be useful, as this passage will doubtless come under the eye of some readers who have not paid much attention to the works of foreign writers on the subject; and Tetens' mention of them is apt to mislead, as implying at first sight, that they were all *German*; that such is *not* the case will presently be seen, and our impression is, that in alluding to those writers, Tetens' leading idea was to distinguish them as *continental* writers, for it would not be fair to suppose that he considered the fact of their having written in the transactions of German learned academies as constituting a nationality.

The celebrated Leonard *Euler*, was born and educated in Switzerland, and resided the greater part of his life in Russia. Christian *Huygens* was a Dutchman. (Notice of their treatises on the subject of Life Annuities and Probabilities will be found in the Essay on Probability, by Sir William Lubbock, and J. D. Bethune). John Henry *Lambert* was a Swiss, but resided some time in Berlin, his treatise on Annuities appeared in the Beytrage, 1st part, and in the Leipsic Magazine for 1780. He was justly considered one of the most learned men of the 18th century. The following extract from one of his biographers will not be out of place :—

" La formule par laquelle il remplaca la table de Mortalité construite sur les registres de Londres, &c., sont des exemples mémorables de cette aptitude qu'il avait acquise, comme il le dit lui-même, en pratiquant fréquemment la construction géométrique des résultats que lui donnait l'analyse; en sorte que l'inspection des formes géométriques lui rappelait sans effort les formules correspondantes, et que, par conséquent, les tables ou séries de faits une fois construites, il avait tout prête une combinaison de calculs propres à les représenter tres approximativement."

John Peter *Sussmilch* was born at Berlin in 1708, studied theology at the Universities of Halle and Jena, was an army chaplain during Frederick William's Silesian campaign, and afterwards obtained church patronage at Berlin. The work upon which his fame rests was the " Göttliche Ordnung," being a treatise " On the Divine decree in the variations of the human race, with regard to births, deaths, &c." This work is frequently quoted by Malthus, Price, Milne, Tetens, and others; it was the result of much study and sound judgment, and seems to have been well patronized. The first edition appeared at Berlin, 1742; the second in 2 vols. 8vo., with additions, 1761; a third edition in 1765; and a fourth edition in 1775, after his death. This last edition contains the Table quoted by Tetens, and comprises a third volume, the whole edited by Baumann.

Lous was Professor of Mathematics and Navigation at the Academy of Sea Cadets at Copenhagen, and *Bugge* was Professor of Astronomy in the University of the same place. Both were Fellows of the Royal Danish Academy of Sciences. Some notice of their labours may be seen in Dr. Price's 2nd volume (page 439, 6th edition).

Carl Chassot *de Florencourt* was author of the "Abhandlungen aus der juristischen und politischen Rechenkunst." Altenberg, 1781, in 4to. Price notices him as the ingenious author of a mathematical treatise on political arithmetic, published in Germany in 1781."

Oeder, of Oldenburg, was apparently Dr. Price's mentor in all that concerns that part of the latter's work, which refers to German authors or Provident Institutions. Some mention of Oeder's own writings will also be found there.

With respect to *Kritter*, we have before us the titles of three works by him on the subject of Widows' Funds, printed at Göttingen and Hamburg, in 1767, and 1768.

Nicholas von *Fuss* (an author also quoted by Milne in his first volume) was born at *Basle* in 1755, and resided for the greater part of his life at Petersburg, as Professor of Mathematics in the Marine corps. He was named a Counsellor of State in 1800, and died in 1826.

Tetens himself, although from writing in the German language he claims to belong to German literature, may still be more correctly considered as a *Dano-German*, having been born in Schleswig, and having resided either in that duchy or in Copenhagen, during the whole of his life. As six years elapsed between the publication of his work, and the date of Dr. Price's death, it is very likely that Tetens (regard being had to his express desire to instruct the British public in some measure) may, through Mr. Oeder or otherwise, have taken means to communicate his researches to Dr. Price. From Morgan's Biography of the latter it will be perceived that he had not only a superfluity of occupation in those years, but that he laboured under increasing ill health, which interrupted the publication of the fourth edition of his work, a matter he had much at heart, and for which he was constantly collecting materials. The consequence of his illness was that the second volume of the work (which would have contained any *additional particulars* on foreign subjects) was entrusted to the care of Mr. William Morgan. (See the latter's "Memoirs of Dr. Price," pp. 173 and 174).

Are Dr. Price's MS. collections yet extant? if so, they would perhaps clear up this point.

On a general method of approximation to the Values of Annuities and Assurances, for long terms of years, depending on One or Two Lives. By SAMUEL BROWN, Esq., Actuary of the Mutual Life Assurance Society.

(*Read before the Institute of Actuaries, 24th June,* 1850.)

THE discovery of some general Law of Mortality, by means of which the values of the contingencies, depending upon human life, might be expressed in some simple formulæ, without the necessity of performing the numerous calculations which are required even for the chances of a single life, and still more in the various cases, in which two or more lives are involved, has occupied the attention and labours of many scientific men. But the result has not hitherto been satisfactory, in spite of the skill with which their investigations have been conducted, and the unwearied patience which they have brought to the task. The failure has probably arisen from the want of a sufficient number of observations, the authenticity of which could be relied upon; or for want of that accuracy in the data, without which it is in vain to attempt to find the traces of a regular law, disturbed as it must be by the peculiar circumstances under which the observations were made, or by the ignorance, and, in some cases it may be, by the wilful errors of those who have been employed to collect the facts. To take, for instance, the census of the whole kingdom, which, if conducted on a uniform plan, at regular intervals, and with the births and deaths from year to year carefully observed according to locality, ought to afford to the scientific enquirer the means of arriving at the general Law of Mortality, if any such existed—can we turn with any confidence to the enumeration of the Living, or the records of Births and Deaths previous to the Registration Act, under which, in 1838, the present improved system of observation was commenced? Before that period, the censuses were taken, either without the ages of the living, or with them at intervals so long, that intervening circumstances might occur to render the whole comparison incorrect. The deficiency in the number of burials as entered in the Parish Registers was so great, and consequently the correction to be made by the computer allowed of a diversity of opinion so wide as to detract very much from the value of the conclusions drawn from the facts. The rough estimate of ages, which even under existing improvements is all that can be expected, when so many millions of persons are to be enumerated in a single day, and the effect of which is very visible in the much larger proportion, represented as living at particular ages, than are at all in agreement with the previously recorded mortality, increases the difficulty of obtaining any true results from such uncertain data.

The registration of the births, which is an important element in ascertaining whether a population is increasing or decreasing, is very deficient even still, and has been noticed by the Registrar General with a view to its correction. Mr. Edmonds, to whose recent valuable paper I shall again refer, considers "that in order to obtain the true number of births, there is required an increase of two-ninth parts of the baptisms and an increase of one-ninth part of the births registered under the new act." With all these defects and inconsistencies it is not surprising that very little assistance has been afforded in ascertaining the true Law of Mortality prevailing in Great Britain from the censuses which have been hitherto taken. Some light will, no doubt, be thrown on the subject, when the Decennial Census to be taken next year shall have been completed with the ability which the Registrar General and his assistants have exhibited in the last ten Reports, and when the results, obtained on a uniform plan, shall be compared with those deduced from the census of 1841.

Perhaps it may be suggested, that if the deficiences and errors to which a public census must always be liable, cannot be easily overcome, we might have recourse with more confidence to the recorded Experience of Life Assurance Companies, where the facts at least may be most accurately observed, where the ages are proved with legal precision, the enumeration of the living at every age made from the books without the possibility of misrepresentation; and the causes of the deaths certified in the presence of witnesses, with an accuracy and minuteness which leaves nothing to be desired in the collection of the observations. There can be no doubt that we have here all the information that can be needed; but there are other circumstances which, without diminishing the accuracy of the data thus registered, detract at present from their value as matters of science. The first of these qualifying circumstances is, that from the method of inquiry, the whole of the lives under observation ought to be carried forward, from year to year, till the last survivor of a particular class expires. Otherwise, we shall be falling into the unphilosophical error of assuming that the future experience is to resemble the past, when the very point at issue is to know in what degree the future will be modified by the variations from existing laws, which we may find to prevail in the early history of a company. The length of time required for this correct series of observations is so great, (extending at least from the average age at which parties enter the society to the extreme limits of the duration of human life,) that very few societies are yet in a condition to furnish the requisite data, even if they had always preserved the materials in a proper form for inquiry, and were willing to incur the expense and labour of making them public. Nor would the mere enumeration of all the mixed classes of lives, as existing at the respective ages, be sufficient for scientific purposes, though it may answer well enough for ascertaining the relative mortality in the society, as compared with that of the table from which the premiums are deduced.

The influence of the Selection of Lives for assurance has been supposed by some writers to terminate within a very short period from the admission into the society; but I am inclined to think, that wherever the facts are sufficiently numerous to give average results, the influence of selection will be felt by a diminution of the mortality below the average before, and increase of it above the average after a period (varying according to the age at entry, or the skill and care shown in the examination), throughout the whole period of life under observation. There are no printed tables, except those of the Equitable Society, in which the numbers of the assured are subdivided into classes from periods of admission, with sufficient minuteness to warrant the deduction of any general law of the effect of Selection at present; but a table, which I have given elsewhere, reduced to the mortality per cent. from the one, which will be found in Mr. Arthur Morgan's preface to the Tables printed in 1834, shows strong indications that additional observations would confirm the interesting fact noticed above.* No one can deny the importance of such a conclusion, (if it be a correct one,) to new companies, amongst the members of which a general impression prevails, that the favourable results of early years only indicate a great improvement in the public health, and consequently undiminished profits, whereas, the conclusion which I should draw from the same facts is, that the mortality in advancing years will be proportionably increased above the average of the older ages. If the valuable materials collected by the Committee of Actuaries, and published as the results of the experience of companies, could be enlarged by the addition of the increasing body of facts observed since the former publication, and the classes of assured separated as above proposed, perhaps from the large number of observations, some very important general laws might be discovered; though I should still be inclined to believe, that on the point now referred to, no decisive opinion could be formed for another thirty or forty years to come. Time, as well as numbers, is a necessary element in an investigation in which the future history of a society is concerned. Neither must it be forgotten, that the regard lately paid to sanitary measures, may, amongst the classes who have suffered the most from the want of government attention to their health and physical condition, act contrary to the interests of societies, which are now extending their benefits to the labouring population. It is possible, (and in my own opinion, not improbable,) that the very creditable sanitary precautions now urged on the public may be the means of preserving numbers of children, through a sickly period of childhood, to live to manhood, it is true, but to enjoy perhaps only a weakly and precarious state of health at a time of life when they begin more to feel and to require the advantages of benefit clubs, and similar institutions. This subject, however, would lead us far away from the object of the present article, and may be resumed on some future occasion.

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* The recent paper by Mr. Higham, "On the Value of Selection amongst Assured Lives," read before the Institute of Actuaries, March 25, 1850, and ordered by the Council to be printed, contains some newly-formed Tables of Expectation, amongst the classes of Lives, selected at different ages, which are most skilfully prepared, and merit particular attention.

I have ventured to draw the notice of the members of the Institute to these reasonings, (though many must already have found their attention occupied by them,) because they serve to explain the difficulties which have hitherto prevented the discovery of a general law of mortality prevailing throughout the whole term of years to which the life of man extends. They at the same time encourage the exertions of the statist and philosopher to persevere in investigations which are of the deepest interest to science and humanity, by the reflection, that every day is not only adding to our recorded experience, but gives it a value which it did not before possess, by the increased duration of the period over which the enquiries may be pursued.

In the meantime the question arises, whether we cannot by some simple formulæ, applied to the original facts, approximate to the results of the complicated and numerous calculations which are necessary for ascertaining the probabilities of living and dying in cases where one or more lives are concerned, or in the still more laborious processes, involving the improvement of money during a life or lives at different rates of interest. In the latter case it will appear almost on inspection, that any hypothesis assuming the law of a geometrical progression, increasing in the ratio of mortality from age to age, or decreasing in the numbers surviving from age to age, will have a great advantage over any other method that could be proposed, if, in other respects, it could be presented in a form sufficiently simple to be readily understood, and easily reduced to practice, and if it could be made to represent the original facts with sufficient accuracy. Scarcely any authentic tables of observation however have been found, which allow of this hypothesis being used at only one rate of progression throughout the whole series of ages in the table. At some portion of the period between fifty and sixty years of age, a very rapid increase in the rate of mortality is found to take place, which continues with more or less regularity, but always very much above the earlier portion of the table, to the last age of the living. The decrease of the numbers living at each succeeding age, out of a given number living at any one age, is only found to be in geometrical progression for a short period of years, and this necessitates a similar calculation to be frequently repeated, and adds much to the labour of obtaining the value of an annuity upon a life for a long term of years, or for the term by which the duration of life according to the observations is limited. In the first of the two valuable and learned papers which Mr. Gompertz gave to the world through the Transactions of the Royal Society in 1820, he introduces this hypothesis, for small intervals, by showing that "we may take an interval m from n so small, whatever be the real constitution of the function, that the number of the living during that interval shall decrease so as to form a geometrical progression, very nearly, whilst the portions of time increase in an arithmetical progression, and that the decrements of living are also in consequence, very nearly in geometrical progression; and we may moreover, in this, as in the former case, (viz., that the intervals of age may be taken so small, that whatever the law of mortality may be, during any portion of any the same interval, the decrements may be considered proportional to the time,) accommodate the function so as to be accurate at the two extremes."

The second paper is a continuation of the same subject, published in the Philosophical Transactions in 1825, in which, from the examination of different tables, he is led to believe "that the law of geometrical progression pervades in an approximate degree large portions" of such tables. In a subsequent part of the same paper, Mr. Gompertz has enunciated what may, with greater probability, be deemed to represent the general law of mortality, though the circumstances by which it may be modified are so numerous, that it will require great care and attention on the part of those who would apply the formulæ deduced therefrom, to fix the constants, so as to represent accurately the rate of mortality amongst the class of persons for whom the calculations may be required. Mr. Gompertz remarks, "it is possible, that death may be the consequence of two generally coexisting causes; the one, chance, without previous disposition to death or deterioration; the other, a deterioration, or an increased inability to withstand destruction. If, for instance, there be a number of diseases to which the young and old are equally liable, and likewise which should be equally destructive, whether the patient be young or old, it is evident, that the deaths amongst the young and old by such diseases, would be exactly in proportion of the number of young to the old, provided those numbers were sufficiently great for chance to have its play; and the intensity of mortality might then be said to be constant, and were there no other diseases but such as those, life of all ages would be of equal value, and the number of living and dying, from a certain number living at a given earlier age, would decrease in geometrical progression as the age increased by equal intervals of time; but if mankind be continually gaining seeds of indisposition, or in other words, an increased liability to death, which appears not to be an unlikely supposition with respect to a great part of life, (though the contrary appears to take place at certain periods,) it would follow, that the number of living out of a given number of persons at a given age, at equal successive increments of age, would decrease in a greater ratio than the geometrical progression; and then the chances against the knowledge of any one having arrived to certain defined terms of old age, might increase in a much faster progression, notwithstanding there might still be no limit to the age of man."

"If the average exhaustions of a man's power to avoid death were such, that at the end of equal infinitely small intervals of time he lost equal portions of his remaining power to oppose destruction which he had at the commencement of those intervals, then at the age x, his power to avoid death or the intensity of his mortality, might be denoted by aq^x, a and q being constant quantities; and if L_x be the number living at the age x, we shall have $a\mathrm{L}_x \times q^x \dot{x}$ for the fluxion of the number of deaths

$$= -(\mathrm{L}_x)^{\cdot} \therefore abq^x = -\frac{\dot{\mathrm{L}}_x}{\mathrm{L}_x} \therefore abq^x = -\text{hyp. log. of } b \times \text{hyp. log. of } \mathrm{L}_x$$

and putting the common log. of $\frac{1}{b}$ × square of the hyp. log. of 10 $= c$, we have $c.q^x =$ com. log. of $\frac{L_x}{d}$; d being a constant quantity, and therefore L_x or the number of persons living at the age $x = d.\overline{g}|^{q^x}$ g being put for the number whose common log. is c."

The following sentence deserves attention, as summing up the reasons for accepting an hypothesis of this nature, founded as it is on higher grounds than most of those which have been previously advocated :—"This equation between the number of living and the age becomes deserving of attention, not in consequence of its hypothetical deduction, which in fact is congruous with many natural effects, as for instance the exhaustions of the receiver of an air-pump by strokes repeated at equal intervals of time, but is deserving of attention because it appears corroborated during a long portion of life by experience, as I derive the same equation from various published Tables of Mortality during a long period of man's life, which experience therefore proves, that the hypothesis approximates to the law of mortality during the same portion of life; and in fact *the hypothesis itself was derived from an analysis of the experience here alluded to.*"

Mr. Gompertz then proceeds to explain the various tables to which he has applied this hypothesis; and as the volume in which the above article appears may not be in the hands of every younger student, for whom the paper which I have now the honour of laying before the members of the Institute is more especially designed, I subjoin the formula which he has deduced to obtain the number living at any given age x by different tables.

			(λL_x)		
Ages 15 to 55	Northampton Table	Log. of living at age x	$= 3{\cdot}9964$ —	Number whose log. is	$(\overline{1}{\cdot}11556+{\cdot}011213x)$
15 to 55	Deparcieux Table in Baily's Ann.	„	$= 3{\cdot}1557$ —	„	$(\overline{1}{\cdot}25095+{\cdot}00704\,x)$
10 to 50	Swedish Mortality in Baily's Ann.	„	$= 3{\cdot}8703$ —	„	$(\overline{2}{\cdot}89861+{\cdot}013145x)$
10 to 60	Milne's Carlisle Table	„	$= 3{\cdot}88631$ —	„	$(\overline{2}{\cdot}88126+{\cdot}0126\,x)$
60 to 100	Ditto	„	$= 3{\cdot}79657$ —	„	$(\overline{3}{\cdot}74767+{\cdot}03706\,x)$
20 to 60	Equitable Experience	„	$= 3{\cdot}813$ —	„	$(\overline{2}{\cdot}6051+{\cdot}0149875x)$

The last is deduced from the rough comparison with the Northampton Table, which Mr. Morgan appended to a note to the sixth Edition of Dr. Price's Works, and the results by Mr. Gompertz' hypothesis somewhat differ from the Tables of Equitable Experience as printed by the Society.

In the second portion of this interesting paper, Mr. Gompertz proceeds to give examples of the use of the Tables of what are called "accommodated ratios," which are intended to expedite the operations required, from assuming the number of persons living at equal intervals of successive ages to be in geometrical progression, and the periods taken sufficiently short to permit this assumption to be a near approximation to the truth. It is unnecessary to enter into any description of these Tables,* which are extremely useful where an approximation to the values of Annuities on several lives may be required for short periods, my object being rather to explain a method by which, assuming the same law of geometrical progression in the ratio of mortality at successive equal intervals of age, we may, without any tables at all, obtain the values of Annuities and Assurances, for one or two lives, for a term of thirty or forty years, provided the last year of this term falls within what Mr. Edmonds designates the period of manhood. This period very nearly corresponds with those for which Mr. Gompertz has given the formulæ, which I have before quoted, and according to different Tables will be found to vary from 10 or 12 to about 55 or 60 years of age.

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* It may be observed that the use of these Tables will be found to shorten very much some portion of the work in the approximation now proposed. It will be seen on inspection by those who know the formation of them.

It is known, I believe, to most of those who take an interest in the subject of Life Assurance, that Mr. Edmonds considers he has discovered the true ratio of mortality at each of the three periods, marked out by nature, and easily discoverable in all tables of observations, as those of infancy, manhood, and old age, the first being marked by a decreasing ratio of mortality of about 32½ per cent. per annum to about 8 years of age; the second by an increasing ratio of 3 per cent. from 12 to 55 years of age; and the last, by the more rapidly increasing ratio of 8 per cent. in each successive age of life to the close of the tables. Mr. Edmonds, in his work published in 1832, contends, "that the new theory is universally true. All valuable observations made in Europe concur in proving its truth, and recent extensive and accurate observations made on the Jamaica slave population, of African parentage, are in conformity with it. Whence the conclusion is warrantable, that the new theory is equally applicable to the lowest as well as to the highest grade of humanity, and to the inhabitants of tropical as well as of polar regions." Since the publication of that work, Mr. Edmonds has written a number of valuable papers to prove the truth of the numerical law of his theory, examining and comparing all the authentic observations, the accuracy of which could be sufficiently relied upon. In the *Lancet* of 9th and 16th March of this year, will be found a very important article on this subject, comparing the results deduced from the Registrar General's Reports of deaths, during the seven years 1838 to 1844, and the enumeration of the living in 1831, not only with his Theoretical Tables, but with the previous imperfect observations of the living and the deaths in Great Britain, to which I have before alluded. There are so few collections of facts which have been made with the care and accuracy, and with the minute statement of particulars to give them the desirable authority for deductions of so much importance, and the corrections required must be so open to the arbitrary adjustment of individual skill, that the discovery of a law, so extensive as that asserted to govern the mortality of the whole human race, may require with many minds much more proof than can at present be offered. The remarkable paper however by Mr. Gompertz, "On the nature of the function expressing the law of human mortality," and the practical researches of Mr. Edmonds, which have in almost every case ended in proving the truth of the theory by actual numerical results, deserve more investigation than they have hitherto received. Perhaps the higher class of mathematicians, to whom Mr. Gompertz' paper has been principally confined, may have shrunk from the laborious compilation of facts, or the troublesome calculations of those already recorded, whilst the data were so uncertain or so ill arranged to facilitate enquiry. If this attempt to show the usefulness of an approximation to the true results of the theory, obtained by the very elementary rules of algebra, may draw attention to the theory itself, and induce some of the members of the Institute, who may have leisure at command, to examine, on the plan pursued by Mr. Edmonds, the collections of facts already made, with a view to test its truth or error, it may tend either still further to establish its correctness or to lead to the true law which it is so desirable to ascertain.

Before concluding this introduction, it may be remarked, that Mr. Galloway, in the formation of the tables from the Amicable Experience, has used Mr. Gompertz' formula as a final correction in the 9th column of Table III, employing the same constants from age 45 to 93, and the formula which gives the number of survivors at any intermediate age, (y_{45} being the number living at age 45) is

$$\log. y_{45+x} = 4.08966 - \left\{ \begin{matrix} \text{the number} \\ \text{whose log. is} \end{matrix} \right\} \quad 8.95259 + .0296275\ x$$

In Mr. Farren's recently published and very useful "Life Contingency Tables," Part I., Mr. Gompertz' formula is also applied to the continuation of the corrected table, at ages where the admissions are too few, to allow of the supposition, that the same mixed generic law will continue to prevail in the general mortality," as prevailed previously; and in Section I. will be found a full account of Mr. Gompertz' theory, and the method of obtaining his formulæ.

Method of approximating, from original Tables of Observations, to the Values of Life Contingencies (whether involving or not the Interest of Money,) on any Single or on any Two Joint Lives for long Terms of Years.

I. Probability of a single life at any given age living any number of years n.

Let m = the ratio of mortality to an unit of life, at the lowest age in the Table to which the constant will apply, which I will call the standard age.

x = the common ratio, with which the mortality increases from year to year.

p = the number of years difference between the standard age and the given age.

Then will mx^p represent the rate of mortality at any age, p years older than the standard age.

The following Table will exhibit the respective probabilities of dying in a year and living to the end of a year, at the standard and the following ages:

Age.	Probability of dying in a year.	Probability of living a year.
When $p = 0$	$mx^p = m$	$1 - m$
$p = 1$	$mx^p = mx$	$1 - mx$
$p = 2$	$mx^p = mx^2$	$1 - mx^2$
$p = 3$	$mx^p = mx^3$	$1 - mx^3$
$p = n$	$mx^p = mx^n$	$1 - mx^n$

The probabilities of surviving to the end of 1, 2, 3, n years, from the given age p, will be respectively,

Probability of a life aged p years older than the standard age surviving to age

$$p+1 = \left(1 - mx^{p}\right)$$

$$p+2 = \left(1 - mx^{p}\right) \cdot \left(1 - mx^{p+1}\right)$$

$$p+3 = \left(1 - mx^{p}\right) \cdot \left(1 - mx^{p+1}\right) \cdot \left(1 - mx^{p+2}\right)$$

$$p+n = \left(1 - mx^{p}\right) \cdot \left(1 - mx^{p+1}\right) \cdot \&c. \ldots\ldots \left(1 - mx^{p+n-1}\right)$$

Now, it will be found, that where the ratio of increase in the mortality from year to year does not exceed three per cent., or where x does not exceed 1·03, which rarely happens in any table of observations between the ages 15 and 55, the first three terms of the series, formed by multiplying together the factors in the last product, will afford the means of approximating very nearly indeed to the Expectations of life, and the values of Annuities and Assurances on single or on any two joint lives for any term of years, in which the oldest life at the end of the term does not exceed 55 years, or the age to which the above value of x can be used without differing too much from the original observations. After that age, by most tables, the increase in the ratio of mortality from year to year is so rapid, that the same number of terms will not be sufficient to give results with the desired accuracy. The formula for the continuation of the series from age 55 to the oldest life in the Table, or in cases where three lives are involved, must be reserved for another paper.

The product $\left(1 - mx^{p}\right) \cdot \left(1 - mx^{p+1}\right) \cdot \left(1 - mx^{p+2}\right) \cdots \left(1 - mx^{p+n-1}\right)$ may be resolved into the following series:

$$\begin{array}{rcll}
1 - mx^{p} & & & \\
\hline
- mx^{p+1} & + & m^{2}x^{2p+1} & \\
\hline
- mx^{p+2} & + & m^{2}x^{2p+2} & \\
 & + & m^{2}x^{2p+3} & - \; m^{3}x^{3p+3} \\
\hline
- mx^{p+3} & + & m^{2}x^{2p+3} & - \; m^{3}x^{3p+4} \\
 & + & m^{2}x^{2p+4} & - \; m^{3}x^{3p+5} \\
 & + & m^{2}x^{2p+5} & - \; m^{3}x^{3p+6} \\
\hline
- mx^{p+4} & + & m^{2}x^{2p+4} & - \; m^{3}x^{3p+5} \\
 & + & m^{2}x^{2p+5} & - \; m^{3}x^{3p+6} \\
 & + & m^{2}x^{2p+6} & - \; m^{3}x^{3p+7} \\
 & + & m^{2}x^{2p+7} & - \; m^{3}x^{3p+7} \\
 & & & - \; m^{3}x^{3p+8} \\
 & & & - \; m^{3}x^{3p+9} \\
\hline
\end{array}$$

$$\begin{array}{llllll}
-\,mx^{p+n-1} & + & m^{2}x^{2p+n-1} & - & m^{3}x^{3p+n} & \\
 & + & m^{2}x^{2p+n} & - & m^{3}x^{3p+n+1} & \\
 & + & m^{2}x^{2p+n+1} & - & m^{3}x^{3p+n+2} & \\
 & & \text{to} & & \text{to} & \\
 & + & m^{2}x^{2p+2n-3} & - & m^{3}x^{3p+3n-6} & \text{\&c.}
\end{array}$$

The general formula for the summation of these series, so that one term may be derived from the other (without the necessity of continued multiplication), to any given number of terms required, will be

$$1-\sum m.x^{p}.x^{n}+\sum m^{2}.x^{2p}.\left(\frac{x^{n}-1}{x-1}\right)x^{n}-\sum .m^{3}.x^{3p}.\left(\frac{x^{2n}-x^{2}}{(x^{2}-1)(x-1)}-\frac{x^{n}-x}{\overline{x-1}^{2}}\right).x^{n}\text{\&c.}$$

$$\underbrace{\text{From }\; n=0 \qquad\qquad n=1 \qquad\qquad\qquad\qquad n=2}$$

to $n =$ one less than the number of factors in the given product,

in which it will be perceived that the part within ( ) in each term is the sum of the variable portion under the index n of the preceding term. It will only be necessary to take the first three terms in the summation of the separate series (omitting those in which higher powers than m^2 are involved), which, according to the preceding formula, will evidently be,

$$1-m.x^{p}.\left(\frac{x^{n}-1}{x-1}\right)+m^{2}.x^{2p}.\left(\frac{x^{2n}-x^{2}}{(x^{2}-1)(x-1)}-\frac{x^{n}-x}{\overline{x-1}^{2}}\right)$$

to obtain a very near approximation to the probability of a life at any given age, living to the end of n years, from that age, within the limits before mentioned.

If m be assumed as the ratio of mortality at any standard age, as for instance the age 15, and x the ratio of increase of mortality from year to year, both these values being determined by trials so as to agree as nearly as possible with the original facts observed, then $\frac{m}{x-1}$, $\frac{m^{2}x^{2}}{(x^{2}-1)(x-1)}$ and $\frac{m^{2}x}{\overline{x-1}^{2}}$ are constants, which being once calculated may be used throughout the Table both for single and joint lives, and we will call them

$$\frac{m}{x-1} = \mathrm{X}$$

$$\frac{m^{2}x^{2}}{(x^{2}-1)(x-1)} = \mathrm{Y}$$

$$\frac{m^{2}x}{\overline{x-1}^{2}} = x.\mathrm{X}^{2} = \mathrm{Z}$$

and the formula for the probability of living n years then becomes,

Formula (1) $1+\mathrm{Y}.x^{2p}\left(x^{2n-2}-1\right)-\left(\mathrm{X}.x^{p}.\left(x^{n}-1\right).+\mathrm{Z}x^{2p}.\left(x^{n-1}-1\right)\right)$

or $\left(1+\mathrm{X}.x^{p}+\left(\mathrm{Z}-\mathrm{Y}\right)x^{2p}\right)+\mathrm{Y}.x^{2p}.x^{2n-2}-\left(\mathrm{X}x^{p}+\mathrm{X}^{2}x^{2p}\right)x^{n}$

If $p = 0$, or the given life be that of the standard age of the Table, the formula may be further reduced to

Formula (2) $\left(1+\mathrm{X}+\mathrm{Z}-\mathrm{Y}\right)+\mathrm{Y}.x^{2n-2}-\left(\mathrm{X}+\mathrm{X}^{2}\right)x^{n}$

in which the parts of the expression within ( ) being once computed, will serve for obtaining the probabilities of the same life living to any age thereafter, and may be called V and V′.

It will be convenient to introduce here the short table containing the Constants, the values of which are calculated for three Tables of Mortality, from which examples are hereafter given to show how closely the results approach to the values obtained from Tables corrected by the law of geometrical progression, as well as from the original facts.

Logarithms and Values of Constants in the Formulæ proposed.

Symbols for Probabilities of Living.	EDMONDS'S TABLES.				EQUITABLE EXPERIENCE TABLE "A."	
	Mean Mortality. $x = 1·03 = \lambda\ ·0128372$ Age 12. $m = .00637 = \lambda\ \bar{3}·8041394$		Village or Carlisle. $x = 1·03 = \lambda\ ·0128372$ Age 12. $m = ·005331 = \lambda\ \bar{3}.726$		$x = 1·03 = \lambda .0128372$ Age 15. $m = ·00575 = \lambda.\ \bar{3}.7596678$	
	Log.	No.	Log.	No.	Log.	No.
$X = \frac{m}{x-1}$	$\bar{1}$·3270181	·212333	$\bar{1}$·2488787	·177369	$\bar{1}$·2825465	·191667
$Y = \frac{m^2 x^2}{(x^2-1)(x-1)}$	$\bar{2}$·3722146	·023562	$\bar{2}$·2159358	·016441	$\bar{2}$·2832714	·019199
$xX^2 = Z = \frac{m^2 x}{\overline{x-1}^2}$	$\bar{2}$·6668734	·046438	$\bar{2}$·5105946	·032404	$\bar{2}$·5779302	·037838
Where $p = o$						
$(1 + X + Z - Y) = V$	0·0917398	1·235207	0·0767612	1·193332	0·0828951	1·210306
$(X + X^2) = V'$	$\bar{1}$.4106389	·257418	$\bar{1}$·3197908	·208829	$\bar{1}$·3587000	·228402
Additional Symbols for Expectation of Life.						
$X' = X.\ \frac{x}{x-1}$	0·8627340	7·290108	0·7845946	6·089682	0·8182624	6·580553
$Y' = Y.\ \frac{1}{x^2-1}$	$\bar{1}$·5875973	·386899	$\bar{1}$·4313185	·269969	$\bar{1}$·4986541	·315249
$Z' = Z.\ \frac{1}{x-1} = X^2.\frac{x}{x-1}$	0·1897521	1.547933	0·0334733	1·080123	0·1008089	1·261273

Both Mr. Edmonds and Mr. Farr have published sets of Tables computed on the hypothesis of a geometrical progression in the rate of mortality, and to these I shall have recourse to prove the accuracy of the simple formula here suggested. I have slightly altered the table given by the former, so that $x = 1\cdot03$ instead of $1\cdot0299117$, which will scarcely affect the results in any perceptible degree, if the value of m be adjusted accordingly.

I shall add a few examples founded on the same law, applied to the Experience of the Equitable Society, m and x being deduced from the original observations and the results compared with the corrected Table A, as printed for the use of the members of the Equitable Society by Mr. Arthur Morgan.

In deducing the log. of $\overline{x-1}$ from the log. of x, I have used Mr. Gray's valuable "Tables and Formulæ for the Computation of Life Contingencies," published in 1849, a work which will be found of the utmost importance in calculations of this nature, and it may be also remarked that to use the same Tables $\left(Xx^p + X^2x^{2p}\right)$ in Formula (1), and wherever it may hereafter occur may be converted into $Xx^p . \left(1 + Xx^p\right)$

EXAMPLE 1.—From Mr. Edmonds' Table of Mean Mortality.

Let it be required to find the probability of a life, age 12, living to age 42.

Here (age 12 being the standard age) $p = 0$ and $n = 30$.

$V = \left(1 + X + Z - Y\right) = 1\cdot2352$

$Y = \lambda\,\bar{2}\cdot37221$

$5\cdot5534 = x^{58} = \lambda\ \cdot74456$

$\lambda\ 1\cdot11677 = \cdot1308$

$1\cdot3660$

$-\ \cdot6248$

Age 12. Probability of living 30 years $\Big\}$ $\cdot7412$

$V' = \left(X + X^2\right) = \lambda\ \bar{1}\cdot41064$

$2\cdot4273 = x^{30} = \lambda\ \cdot38512$

$\lambda\ \bar{1}\cdot79576 = \cdot6248$

By Edmonds $\cdot7357$

Difference $+ \cdot0055$

EXAMPLE 2.—By the same Table, find the probability of a life, age 22, attaining to age 52.

Here Formula (1) must be used. $p = 10$ $n = 30$.

$$1 + Y\,x^{20}\left(x^{58} - 1\right) - \left(X . x^{10} . \left(x^{30} - 1\right) + Z . x^{20} . \left(x^{29} - 1\right)\right)$$

$Y = \lambda .\ \bar{2}\cdot37221$

$x^{20} = 1\cdot8061 = \lambda\ \cdot25674$

$\left(x^{58} - 1\right) = 4\cdot5534 = \lambda .\ \cdot65834$

$1.$

$\lambda\ \bar{2}.37221 = .1938$

1.1938

$.5211$

Age 22. Probability of living 30 years $\Big\}$ $.6727$

$X = \lambda\ \bar{1}\cdot32702$

$x^{10} = 1\cdot3439 = \lambda\ \cdot12837$

$x^{30} = 1\cdot4273 = \lambda\ \cdot15452$

$\lambda\ \bar{1}\cdot60991 = \cdot4073$

$Z = \lambda\ \bar{2}.66687$

$x^{20} = \lambda\ \cdot25674$

$\left(x^{29} - 1\right) = 1\cdot3566 = \lambda\ .13245$

$\lambda\ \bar{1}.05606 = .1138$

$-\ .5211$

By Edmonds' $.6623$

Difference $+ .0104$

It will be unnecessary to repeat the whole of the process in further examples; but the following results from the other tables, of which the constants are given, will shew the value of the approximation in other cases.

	Age.	Age to be attained.	Probability by the approx.	Difference from Edmonds.	Difference from Milne.
EXAMPLE 3. Edmonds' Village or Carlisle Table	12	42	·7777	+ ·0034	+ ·0059
EXAMPLE 4. Ditto.	22	52	·7156	+ ·0062	+ ·0035

In correcting the Table of the Equitable Experience, by assuming $x = 1·03$. I have used ·00575 as the ratio of mortality at the standard age 15. In the first ten years, this will give rather too favourable a rate of mortality, when compared with the original facts; but any other mode of correction by regular progression would produce a similar error, and the difference is not important. The total ratio of mortality to a unit of a life at every age, from 15 to 55, will, by this hypothesis, be = ·43255; by the original observations ·42523, show-only a difference of 73 deaths in the whole period in 10,000 living at each age, and agreeing, at every interval after the first ten years, very closely with the observed facts.

	Age.	Age to be attained.	Probability by the approx.	Difference from Orig. facts.	Difference from Table A,
EXAMPLE. 5. Equitable Experience	15	55	·6578	+ ·0045	+ ·0001
" 6. Ditto.	35	55	·7579	— ·0028	— ·0108
" 7. Ditto.	15	35	·8568	— ·0020	+ ·0012

In the Registrar General's Sixth Report will be found Mr. Farr's English Life Table, with a number of useful Tables constructed from the corrected data. The mortality, in proportion to the living, obtained from the Census in 1841, appears first to have been corrected by assuming the increase from year to year to be in geometrical progression, and afterwards again correcting the logarithm expressing the number of survivors, at each age, by third differences up to age 55, and by fourth differences after that age.

By the Table for Male lives. $\Big\}$ $m = ·0069605 = \lambda.\ \bar{3}·8432656.$ and $x = ·1026011 = \lambda\ ·0111522$

Therefore according to our present method of approximation:

$$X = \lambda\ \bar{1}·4281086$$

$$Y = \lambda\ \bar{2}·5718680$$

$$Z = \lambda\ \bar{2}·8673694$$

and by using the same formula as before, the probability of a life, age 15, attaining to 55, will by approximation = ·6218; by Mr. Farr's Table = .6178. The difference therefore is only + .0040.

II. On the probability of Two Joint Lives both living *n* years.

Let us assume the case of two lives, A and B, whose ages are respectively p and q years older than the standard age, of which the ratio of mortality at any given age may be expressed in the same manner as before, mx^p and mx^q; and the probability of their both living a year at the given age, and at each successive age therefrom, by

$$\left(1-mx^{p}\right)\cdot\left(1-mx^{q}\right)=1-m\left(x^{p}+x^{q}\right)+m^{2}.x^{p+q}$$
$$\left(1-mx^{p+1}\right)\cdot\left(1-mx^{q+1}\right)=1-m\left(x^{p+1}+x^{q+1}\right)+m^{2}.x^{p+q+2}$$
$$\left(1-mx^{p+2}\right)\cdot\left(1-mx^{q+2}\right)=1-m\left(x^{p+2}+x^{q+2}\right)+m^{2}.x^{p+q+4}$$
$$\left(1-mx^{p+n-1}\right)\cdot\left(1-mx^{q+n-1}\right)=1-m\left(x^{p+n-1}+x^{q+n-1}\right)+m^{2}.x^{p+q+2n-2}$$

and these successive probabilities being multiplied together for n years will give, according to the usual rule, the probability of both the lives attaining to the end of n years.

By taking for the approximation proposed only the first three terms, as in the case of single lives, we shall obtain the following series:

$$\begin{array}{ll}
1-m\left(x^{p}+x^{q}\right) & \\
\hline
-m\left(x^{p+1}+x^{q+1}\right) & +m^{2}\left(x^{2p+1}+2x^{q+p+1}+x^{2q+1}\right)\\
\hline
-m\left(x^{p+2}+x^{q+2}\right) & +m^{2}\left(x^{2p+2}+2x^{q+p+2}+x^{2q+2}\right)\\
 & +m^{2}\left(x^{2p+3}+2x^{q+p+3}+x^{2q+3}\right)\\
\hline
\multicolumn{2}{c}{\text{to}}\\
-m\left(x^{p+n-1}+x^{q+n-1}\right) & +m^{2}\left(x^{2p+n-1}+2x^{q+p+n-1}+x^{2q+n-1}\right)\\
 & \text{to}\\
 & +m^{2}\left(x^{2p+2n-3}+2x^{q+p+2n-3}+x^{2q+2n-3}\right)\\
\hline
\end{array}$$

The sum of which series

$$=1-m\cdot\left(x^{p}+x^{q}\right)\cdot\left(\frac{x^{n}-1}{x-1}\right)+m^{2}\cdot\overline{x^{p}+x^{q}}\,|^{2}\cdot\left(\frac{x^{2n}-x^{2}}{\left(x^{2}-1\right)\left(x-1\right)}-\frac{x^{n}-x}{\overline{x-1}\,|^{2}}\right)$$

From which it evidently appears, that having obtained the constants for the given Table of Mortality, as explained in the article on Single Lives, the approximation to the probabilities of living of two Joint Lives may be calculated with almost equal facility. The formula will be:

$$1+\text{Y}.\overline{x^{p}+x^{q}}\,|^{2}\cdot\left(x^{2n-2}-1\right)-\left(\text{X}.\left(x^{p}+x^{q}\right)\cdot\left(x^{n}-1\right)+\text{Z}.\,\overline{x^{p}+x^{q}}\,|^{2}\cdot\left(x^{n-1}-1\right)\right)$$

Example 8.—Edmonds' Mean Mortality. To find the probability that two lives, both aged 12, together attain 30 years.

Here both p and $q=0$ $\quad n=30$

therefore $(x^{p}+x^{q})=2.$

$\text{Y} = \lambda\,\bar{2}.37221$ $\qquad$ $\text{X} = \lambda\,\bar{1}\cdot32702$

$(x^{56}-1)=\lambda\ .65834$ $\qquad$ $(x^{30}-1)=\lambda\ \cdot15452$

1.

$\lambda\,\bar{1}\cdot03055=\cdot10729\times4=\cdot4292$ $\qquad$ $\lambda\,\bar{1}\cdot48154=\cdot30307\times2=\cdot60614$

1.4292 $\qquad$ $\text{Z} = \lambda.\,\bar{2}\cdot66687$

$-$ .8581 $\qquad$ $(x^{29}-1)=\lambda\ \cdot13245$

By Edmonds' .5413 $\qquad$ .5711 $\qquad$ $\lambda\,\bar{2}\cdot79932 = .063\times4$ $\quad$ .25200

Difference + .0298

$-$ .85814

	Ages.	Probability of attaining to	By approximation.	Difference from Edmonds'
Example 9.—Edmonds' Mean Mortality . . .	22-22	52-52	.5054	+ .0668
Example 10.—Edmonds' Village or Carlisle . .	12-12	42-42	.6173	+ .0177
				Difference from Original Facts.
Example 11.—Equitable Experience.	15-15	45-45	.5972	+ .0046
Example 12.—Ditto . .	25-25	55-55	.5254	+ .0271

If these differences should appear too great, it must be remembered that they principally arise in the last few terms of these long series; and in the summation of the series for the Expectations of Life or the values of Life Annuities they will in a great measure disappear.

III.—On the Expectation of Life by the Approximation.

The Curtate Expectation is the sum of the probabilities of living 1, 2, 3, &c. years, to which half a year being added, the true Expectation will be obtained.

If in the formula

$$1 + Y.x^{2p}(x^{2n-2}-1) - \left(Xx^{p}.(x^{n}-1) + Zx^{2p}(x^{n-1}-1)\right)$$

n be taken successively equal to 1, 2, 3, &c., the sum of these expressions for n terms, will give the Expectation for n years of a life whose ratio of mortality is mx^{p}.

The formula for the Expectation of Life by the proposed Approximation, therefore becomes,

$$n\left(1+X.x^{p}+(Z-Y)x^{2p}\right)+Yx^{2p}\left(\frac{x^{2n}-1}{x^{2}-1}\right)-\left(Xx^{p}+X^{2}x^{2p}\right)\frac{x}{x-1}(x^{n}-1)$$

And if $Y.\frac{1}{x^{2}-1}$ be computed and called Y'

$X.\frac{x}{x-1}$ " " X'

$X^{2}.\frac{x}{x-1}$ " " Z'

These values will also form constants, which may be arranged in a small table, and will serve for all the calculations of the Expectation of Single or two Joint Lives by the approximation. The formula then becomes

Formula (3) $n\left(1+Xx^{p}+(Z-Y)x^{2p}\right)+Y'.x^{2p}(x^{2n}-1)-\left(X'x^{p}+Z'x^{2p}\right).(x^{n}-1)$

And where $p=0$ or at the Standard age of the table

Formula (4) $n(V)+Y'.(x^{2n}-1)-(X'+Z').(x^{n}-1)$

Example 13.—Edmonds' Mean Mortality at age 12, find the Expectation of Life for 30 years. $p=o$ $n=30$

$(v) = 1\cdot235207$
$n = 30$

$37\cdot0562$
$+\ 1\cdot8926$

$38\cdot9488$
$-\ 12\cdot6150$

$26\cdot3338$

$Y' = \lambda.\bar{1}\cdot58760$
$(x^{60}-1) = \lambda.0\cdot68945$

$\lambda\ \cdot27705 = 1\cdot8926 +$
$(X'+Z') = 8.83804 = \lambda.0\cdot94636$
$(x^{30}-1) = 1.4273 = \lambda.0\cdot15452$

$\lambda 1\cdot10088 = 12\ 6150\ -$

By Edmonds' $26\cdot2825$
Difference $+\ \cdot051$

Example 14.—By the same Table of Observations, find the Expectation of a Life, age 22, for 30 years. $p=10$ $n=30$

$X = \lambda.\bar{1}\cdot32702$
$x^{10} = 1.3439 = \lambda.\ \cdot12837$
$1\cdot$

$\lambda\ \bar{1}\cdot45539 = \cdot28536$

$(Z-Y) = .022876 = \lambda.\bar{2}\cdot35938$
$x^{20} = 1.8061 = \lambda.\ \cdot25674$

$\lambda\ \bar{2}\cdot61612 = \cdot04132$

$30 \times 1\cdot32668 = 39\cdot8004$
$+\ 3\cdot4181$

$43\cdot2185$
$-17\cdot9739$

$25\cdot2446$

By Edmonds' $25\cdot1624$
Difference $+\ \cdot082$

$Y' = \lambda.\bar{1}\cdot58760$
$(x^{60}-1) = \lambda.\ \cdot68945$
$x^{20} = \lambda.\ .25674$

$\lambda.\ \cdot53379 = 3\cdot4181$
$X' = \lambda.\ \cdot86273$
$x^{10} = \lambda.\ \cdot12837$
$(x^{30}-1) = \lambda.\ \cdot15452$

$$\left.\begin{array}{l} \lambda.1\cdot14562 = 13\cdot9836 \\ Z' = \lambda.\ \cdot18975 \\ x^{20} = \lambda.\ \cdot25674 \\ (x^{30}-1) = \lambda.\ \cdot15452 \\ \lambda\ \cdot60101 = 3\cdot9903 \end{array}\right\}$$

$17\cdot9739$

	Age		By Approx.	Diff.
Example 15.—By Edmonds' Village or Carlisle. Expectation for 30 years	12	= 26.853	26.841	— .012
Example 16.—Ditto	22	= 25.885	25.835	— .050

The Expectations of two Joint Lives whose ratios of mortality, at their given ages, are, respectively mx^p and mx^q, may be found by substituting in the preceding formula $(x^p + x^q)$ wherever x^p occurs.

IV.—On the Values of Annuities upon Single and Two Joint Lives by the Approximation.

Let v^n = the present value of £1 due n years hence; then, by turning to Article I., the value of £1 receivable provided a life at any given age, p years older than the Standard Age, be existing n years hence, will be found

$$=v^n\left(1+Xx^p+(Z-Y)x^{2p}+Yx^{2p}x^{2n-2}-(Xx^p+X^2x^{2p})x^n\right)$$

and the sum of the expressions, from $n=1$ up to $n=$ the given term of years, will be the value of an Annuity of £1 per annum for n years on the given life.

But $\sum .v^n$ from $n=1$ to $n=$ the given term, is the value of an Annuity certain for n years, which, if we denote by I_n, the formula for n years will be,

Formula (5.)

$$I_n\left(1+Xx^p+(Z-Y)x^{2p}\right)+Y.x^{2p}v.\left(\frac{\overline{x^2v}\rceil^n-1}{x^2v\ -1}\right)-(Xx^p+X^2x^{2p})xv.\left(\frac{\overline{xv}\rceil^n-1}{xv\ -1}\right)$$

Formula (6.)

Where $p=o$, or at the Standard Age the formula may be reduced to

$$I_n.V+Y.v.\left(\frac{\overline{x^2v}\rceil^n-1}{x^2v\ -1}\right)-V'.xv\left(\frac{\overline{xv}\rceil^n-1}{xv\ -1}\right)$$

Before proceeding to give examples, I may observe, that the advantage of finding x to represent 1.03, (which it does in the tables we have been using,) will be seen, by its allowing of great facility in the calculations of the Values of Annuities on Single and Joint Lives at 3 per cent., which is a very common rate of interest in office calculations. For in this case it is evident that as $v.=\frac{1}{1.03}$ and $x=1.03$, $xv=1$, and, therefore, $xv.\left(\frac{\overline{xv}|^n-1}{xv-1}\right)=n$; being the sum of n terms of a series, the first term of which is 1, and the common ratio 1. The Formula, then, at the Standard age, becomes for Single Life Annuities at 3 per cent.

$$I_n.V+Y.v.\left(\frac{x^n-1}{x\ -1}\right)-V'.n$$

Example 17.—Edmonds' Mean Mortality. Find the value of an Annuity, at 3 per cent, for 30 years, on a life, age 12.

Here $p=o$, $n=30$, and as $x=v$, the last Formula may be used.

$V=1{\cdot}23521=\lambda.\ {\cdot}09174$ $\qquad$ $Y=\lambda\bar{2}{\cdot}37221$

$I_n=19{\cdot}6004=\lambda.1{,}29226$ $\qquad$ $v=\bar{\lambda}1{\cdot}98716$

$1.38400=24{\cdot}2105$ $\qquad$ $\left(\frac{x^{30}-1}{x\ -1}\right)=\lambda1{\cdot}65532=45{\cdot}2188$

$1{\cdot}0344$ $\qquad$ $\lambda\ {\cdot}01469=1{\cdot}0344$

$25{\cdot}2449$

$7{\cdot}7226$ $\qquad$ $V'.n.={\cdot}25742\times30=7{\cdot}7226$

By Edmonds' 17·549 $\qquad$ 17·5223

Difference —·027

$\left(\frac{x^{30}-1}{x\ -1}\right)=$Amount of £1 per annum, in 29 years at 3 per cent, Compound Interest.

Example 18.—Edmonds' Mean Mortality. Find the value of an Annuity, at 4 per cent., for 30 years, on a life age 22.

$$xv=\lambda.1\cdot995804$$
$$x^2v=\lambda.\cdot008641$$

In this case Formula (5) must be used, $p=10$ $v=\frac{1}{1.04}$ $n=30$

By Example 14.

$\left(1+Xx^{10}+(Z-Y)x^{30}\right)=1\cdot32668=\lambda.\cdot12277$

$I_{30}=17\cdot292=\lambda.1\cdot23785$

$22\cdot9414=\lambda.1\cdot36062$

$+\ 1\cdot6624$

$24\cdot6038$

$-\ 9\cdot5065$

$15\cdot0973$

By Edmonds' 15·063

Difference + ·034

$Y=\lambda.\bar{2}\cdot37221$

$x^{30}=\lambda.\cdot25674$

$\frac{v}{x^2v-1}=\frac{1}{\cdot0209}=\lambda.1\cdot67985$

$\overline{x^2v}|^{30}-1=\lambda.\bar{1}\cdot97195$

$1\cdot6624=\lambda.\cdot22075$

$X.x^{10}=\lambda\,\bar{1}\cdot45539$

By Gray $\left(1+Xx^{10}\right)=\lambda\,\cdot10902$

$\lambda\,\bar{1}\cdot56441$

$xv=\lambda\,\bar{1}\cdot99580$

$\frac{1}{(xv-1)}=\lambda\,2\cdot01704$

$\overline{xv}|^{30}=\bar{1}.87412$

By Gray $\left(\overline{xv}|^{30}-1\right)=\bar{1}\cdot40076$

$9.5065=\lambda\cdot97801$

For the values of Annuities on two joint lives it will be unnecessary to repeat the reasoning; for by discounting the probabilities of both the lives attaining 1, 2, 3, &c., years, in the same manner as we have just done for the single lives, it will be seen almost by inspection, that it requires only to substitute $\left(x^p+x^q\right)$, wherever x^p occurs in the formula for the Single lives, to obtain the value of the Annuity for n years on the Joint lives.

Example 19.—Edmonds' Mean Mortality. Find the value of an Annuity at 3 per cent. for 30 years, on two joint lives, both age 12.

Here $p=o$ and $q=o$, therefore $\left(x^p+x^q\right)=2$

$v=1.03$ $n=30$

$1.$

$2X=\cdot42466$

$4(Z\text{-}Y)\ \cdot09150$

$1\cdot51616=\lambda\,\cdot18074$

$I_{30}=19\cdot6004=\lambda\,1\cdot29226$

$29\cdot7167=\lambda.\bar{1}\cdot47300$

$4\cdot1376$

$33\cdot8543$

$18\cdot1500$

$15\cdot7043$

By Edmonds 15·8205

Difference — ·106

$4Y=\cdot094248=\lambda\bar{2}\cdot97427$

$v=\frac{1}{1.03}=\lambda\bar{1}\cdot98716$

$\frac{x^{30}-1}{x-1}=45\cdot2188=\lambda1\cdot65532$

$4\cdot1376=\lambda\,\cdot61675$

$2X\ \ \cdot42466$

$4X^2=\cdot18034$

$\cdot60500$

$xv\left(\frac{\overline{xv}|^{30}-1}{xv-1}\right)=n\ \ 30$

$18\cdot1500$

V. On Annuities on the longest of two lives for a term of n years by the approximation.

Having already shown the method of approximating to the value of an Annuity on the two single lives, and also to the value of an Annuity on the joint duration of two lives, we may thence deduce the formula for the value of an Annuity for the longest of the two lives during the given term by taking the latter value from the sum of the two former, thus, (representing for greater simplicity $v.\left(\frac{\overline{x^2 v}|^{n}-1}{x^2 v-1}\right)$ by=T, and $xv\left(\frac{\overline{xv}|^{n}-1}{xv\ \ -1}\right)$ by T′). A the life whose ratio of mortality is mx^p and B's=mx^q

Art. 4. Value of Ann. on A's life } $=I_n\left(1+Xx^p+(Z-Y)x^{2p}\right)+Yx^{2p}T-\left(Xx^p+X^2x^{2p}\right)T'$

By Formula (5)
Value of Annuity on B's life.......... } $=I_n\left(1+Xx^q+(Z-Y)x^{2q}\right)+Yx^{2q}T-\left(Xx^q+X^2x^{2q}\right)T'$

Sum of both values—

$$=I_n\left(2+X.(x^p+x^q)+(Z-Y)(x^{2p}+x^{2q})\right)+Y.(x^{2p}+x^{2q})T\Big)-\left(\begin{matrix}X(x^p+x^q)\\+X^2(x^{2p}+x^{2q})\end{matrix}\right)T'$$

From which, deducting the value by approximation of the Annuity on the joint lives—

$$=I_n\left(1+X.(x^p+x^q)+(Z-Y).\overline{x^p+x^q}|^2\right)+Y.\overline{x^p+x^q}|^2.T-\left(\begin{matrix}X(x^p+x^q)\\+X^2.(x^p+x^q)^2\end{matrix}\right)T'$$

Formula (7)
We obtain for the approximation to the value of an Annuity on the Longest of two lives—

$$=I_n\left(1-(Z-Y).2.x^{p+q}\right)-Y.2.x^{p+q}T+X^2.2.x^{p+q}T'$$

Example (20).—Edmonds' Mean Mortality. Find the value of an Annuity on the longest of two lives, both aged 12, for 40 years, at 3 per cent.

Here $p=o$ $q=o$ $v=\frac{1}{1{\cdot}03}$ $n=40$, and since $x=1.03$, we may shorten the operation as before noticed.

1.
$2(Z-Y)=\cdot022876\times2=$ ·04575
·95425=$\lambda\bar{1}\cdot97966$
$I_{10}=$ 23·1148=$\lambda1\cdot36389$
22·0572=$\lambda1\cdot34355$
3·6068
25·6640
3·3048
Answer 22·3592

$2Y=\cdot047124=\lambda\bar{2}\cdot67324$
$v=\frac{1}{1.03}$ $=\lambda\bar{1}\cdot98716$
$\frac{x^{40}-1}{x-1}=72\cdot2342=\lambda1\cdot85874$
λ ·51914=—3·3048

$2X.^2=\cdot09017$
$xv\left(\frac{\overline{xv}|^{40}-1}{xv-1}\right)=\frac{40}{+3\cdot6068}$

By Edmonds 22·413
Difference + ·064

VI. Values of Reversions for terms of years by the approximation.

The probability of any life A, whose ratio of mortality is denoted by mx^{p}, failing in any given year n will evidently be equal to that of its attaining one year less than n multiplied by the ratio of mortality at that age, or by mx^{p+n-1}. The general expression for this probability will therefore be (by referring to article I) for the expression of the probability of living to the age $p+n-1$

$$m.x^{p+n-1}\Big[\Big(1+Y.\,x^{2p}\,(x^{2n-4}-1)-\Big(Xx^{p}.\,(x^{n-1}-1)+Z\,x^{2p}(x^{n-3}-1)\ \Big)\Big]$$

By interpreting n successively by 1, 2, 3, &c. up to the given term, and summing the series, we shall have the sum of the probabilities of dying in each year of the term, or the present value of £1 payable at the end of any year in which the life shall fail during the term, without reckoning interest of money.

By multiplying the above expression by v^{n} we shall obtain the present value of £1 payable in the event of the life failing in any given year n, discounted at the rate of interest represented in v

$$m.x^{p}.x^{n-1}.v^{n}\Big[\big(1+Yx^{2p}(x^{2n-4}-1)-\Big(Xx^{p}.(x^{n-1})+Zx^{2p}.(x^{n-3}-1)\ \Big)\Big]$$

and consequently interpreting n as before, by 1, 2, 3, &c. up to the given term we shall have

$$\sum m.x^{p}.x^{n-1}.v^{n}\Big[\big(1+Yx^{2p}.(x^{2n-4}-1)-\Big(Xx^{p}.(x^{n-1}-1)+Zx^{2p}.(x^{n-3}-1)\Big)\Big]$$

from $n=1$ to $n=$ the given term, for the general expression for the value of a reversion on the life of A for the term

$$=mx^{p}v.\left(\frac{\overline{xv}\rceil^{n}-1}{xv-1}\right)\left(1+X^{p}+(Z-Y)x^{2p}\right)+Y.x^{3p}.\frac{mv}{x^{3}}\left(\frac{\overline{x^{3}v}\rceil^{n}-1}{x^{3}v-1}\right)-\left(Xx^{2p}+X^{2}x^{3p}\right).mv.\left(\frac{\overline{x^{2}v}\rceil^{n}-1}{x^{2}v-1}\right)$$

Formula (8)

$$=mx^{p}.v\left[\left(\frac{\overline{xv}\rceil^{n}-1}{xv-1}\right).\left(1+Xx^{p}-(Z-Y)x^{2p}\right)+Y\frac{x^{2p}}{x^{2}}\left(\frac{\overline{x^{3}v}\rceil^{n}-1}{x^{3}v-1}\right)-\left(Xx^{p}+X^{2}x^{2p}\right).\left(\frac{\overline{x^{2}v}\rceil^{n}-1}{x^{2}v-1}\right)\right]$$

Where $p=o$.

Formula (9) $$m.v.\left[\frac{\overline{xv}\rceil^{n}-1}{xv-1}.\,V+Y\frac{1}{x^{2}}.\left(\frac{\overline{x^{3}v}\rceil^{n}-1}{x^{3}v-1}\right)-V'.\left(\frac{\overline{x^{2}v}\rceil^{n}-1}{x^{2}v-1}\right)\right]$$

EXAMPLE (21).—Edmonds' Table Mean Mortality. Find the value at 3 per cent. of a Reversion of £1 for a term of 40 years on a life age 12.

In this case $p=o$ therefore $1+Xx^{p}+(Y-Z)x^{2p}=V$

and $(Xx^{p}+X^{2}x^{2p})=V'$ in the Table of Constants,

$$v=\frac{1}{1.03}\qquad n=40\qquad xv=1\qquad \frac{\overline{xv}|^{10}-1}{xv-1}=39$$

$$\begin{array}{rr}
nV=39\times.1\cdot23521.= & 48\cdot1731\\
 & +\ 3\cdot5158\\
\hline
 & 51\cdot6889\\
 & -\,18\cdot5943\\
\hline
\lambda1\cdot51975= & 33\cdot0946\\
vm= & \lambda\bar{3}\cdot79130\\
\hline
\text{Answer}\ \cdot20467= & \lambda\bar{1}\cdot31105
\end{array}$$

$$\begin{array}{lr}
Y & =\lambda\,\bar{2}\cdot37221\\
\frac{1}{x^2} & =\lambda\,\bar{1}\cdot97432\\
\overline{x^2}\big|^{40}-1 & =\lambda\ \cdot98412\\
\left(\frac{1}{x^2-1}\right) & =\lambda\,1\ 21538\\
\hline
 & \lambda\ \cdot54603=3\cdot5158\\
\left(X+X^2\right)=V' & =\lambda\,\bar{1}\cdot41064\\
\frac{x^{40}-1}{x-1}= & \lambda\,1\cdot85874\\
\hline
 & \lambda\,1\cdot26938=18\cdot5943
\end{array}$$

By Edmonds ·20772
Difference ·00305

Examples might be given from other tables, and the formula for Survivorship Annuities and Assurances deduced by the same reasoning. But these, together with the more difficult application of the proposed method to ages at which the increase of mortality is so much more rapid, namely, at 55 and upwards, must be reserved for another paper.

S. B.

25th May, 1850.

THE HISTORY OF ASSURANCE.

On indirect Methods of acquiring Knowledge.—The Method of History.—The First Table of Mortality. By EDWIN JAMES FARREN, Esq.

THE term scholar, as current in the English language, has two extreme acceptations, tyro and proficient; or what the later Greeks fancifully termed the alpha and omega of acquirement. If we attempt to trace the steps by which even the adult student of any especial branch of professional or literary knowledge has fairly passed the boundary defined by the one meaning in passing on to that position denoted by the other, it will commonly be found, that in place of that lucid order, that straight line from point to point, which theory, and resolve generally premise, the real order of acquirement has been desultory—the real line of progression, circuitous and uncertain. Having, however, by dint of perseverance, achieved so much of the journey as will enable him to look back with something like exultation upon the distance traversed, the traveller can scarcely help imagining that he is now already in a position to indicate to others a road more direct than that by which he has actually passed. He would close up certain bye-ways, would avoid certain windings, and concludes that by such means his own progress might have been materially advanced. As he further progresses, however, and still finds he can proceed but slowly in the direct line, the conviction at last comes, for, in defiance of his own resolves, it is rarely that he can exclude his own example from the category, that certain *indirect* roads and bye-paths, commonly disregarded as divergent and merely tending to unnecessary delay, are really necessary auxiliaries for the proper survey of surrounding objects, and are essential elements in relieving the monotony of the journey by diversifying the prospect and displaying it in different points of view; for without these alleviations, the mind itself begins to doubt the compensating value of that ultimatum which *in limine* exacts so much toil and affords so little recompense. We become the more convinced that this deviation from the straight and narrow path of theoretical instruction, is really a practical necessity, if while we acknowledge memory to be the function by which we mentally acquire, we consider its sources and action. During childhood the sum of knowledge is nearly wholly obtained by direct means, scarcely anything can be said to be learned that has not been acquired by obvious rote; while after childhood, the memory is rarely, if ever, directly tasked, but is allowed to acquire its own stores by means so indirect, that the possessor himself is barely conscious of his own resources until occasion prompts some demand from the storehouse of his knowledge, and the supply is found ample or scanty as the efforts of a bye-gone industry may have been well or ill directed. Metaphysicians have recognised this difference between child-like and adult, or between direct and indirect memory; and leaving the first wholly unexplained, have traced the second to the association of ideas; while others have further attempted to reduce this to principles under the name of a science of mnemonics, by which certain elements of association are defined and proposed as land-marks to which the memory may from time to time revert by the direct powers of rote. Clever, however, as some of these systems of technical memory have been, they have all gradually fallen into neglect, and the problem still remains unresolved as to the most certain method of at once storing the memory and rendering its stores immediately available, however distant and unexpected the demand. While metaphysicians and others have thus been vainly engaged in attempts to systematise this subject, practice has pointed out an auxiliary method both pleasing and useful, and this method is what may be termed "the method of history." Every subject has its history, and the history of every subject supplies abundance of those very details, as elements for the association of ideas, upon which the function of adult memory is supposed to depend. The progress of history is from simple to complex, the acquirement of any art or science commonly follows the same progression, and not unfrequently treads in the same steps. The "has been" thus becomes the hewer of wood and drawer of water to the "is," as the "is" will be to the "time to come." A knowledge indeed of the history of any class of literature in which we are interested, is the only safeguard we possess against our producing conceptions as new, merely because they are our own, without having made ourselves duly acquainted with what has been produced by others who have gone before us. Mathematicians may be said to have especially erred in this respect, as the diligent reader of Montucla will confirm; for how much labour has often been unconsciously expended in merely reproducing theorems and formula already announced by others; and how many eminent names might be included in the list of plagiarists, unless allowance were made for a deficient knowledge of the history of the subject as developed in writings anterior to their own. The secretary's record of nearly every scientific society has presented lamentable instances of a similar character, in which a life almost may have been spent in labours founded upon some notion, doctrine, or invention considered by the presumed originator as important and new, but which when examined, not in the dark recesses of a solitary enthusiast's closet, but in the open daylight of a general and comprehensive literature, may prove indeed to be important, and so important as to have been already tested and acted on, but considered as new, must be passed aside as merely a curious, because an honest coincidence with the discoveries of previous investigators. Whatever doubts therefore might arise as to the utility of a knowledge of the past history of any subject, *per se*, none can really exist as to its being a powerful auxiliary in aiding our proper understanding of the means and appliances of the present. Esteeming history, therefore, as at least among the indirect elements of a liberal knowledge of any art or science, the Editors of the *Assurance Magazine* have been desirous not to wholly exclude articles of a historical description from their pages, and more especially from their first number; and in compliance with this desire, the present writer has ventured to offer the preceding reflections for the reader's consideration, and to add the following contribution as a species of chapter from the early history of Life Contingencies. It is true that to readers already well acquainted with any subject, but little really new can ever be offered, but as it is hoped that the *Assurance Magazine* will also pass into the hands of persons not hitherto particularly conversant with its legitimate topics, any means of extending such information among educated persons in general appears to be extremely desirable, and the more so, because general readers can scarcely be expected to refer to works except of the present description. In selecting, therefore, an initiatory topic from Life Contingencies, a glance at the origin and construction of the first Table of Mortality upon record, has appeared about the most suitable, and the writer has accordingly endeavoured to treat the matter in as general a style as the nature of the subject and the brevity of a magazine article will permit.

The spur of necessity has in all the paths of life and literature generally produced evidences of its useful application, whether the force of such necessity have been want of money, desire of fame, or the presence of some other exciting cause to determined action. The early history of Tables of Mortality appears to present us with one of these examples. The Royal Society, established in 1660, after having passed through the first stage, since ascertained to be common to scientific institutions, of no want of topics upon which to descant, or of writers willing to treat of them, passed into the no less common second stage, of the dearth of such attributes, when novelty has passed away, when *prestige* has spent its force, and the hitherto willing coadjutor begins to temporise and is no longer content to tug at the labouring oar. In any society, however, really destined to maintain its place among the living, a reaction takes place—its own energies are once more severely tasked to sustain its own existence, and to listlessness succeeds a resolute activity; so with the Royal Society. After having for some years suspended the publication of their

"Transactions" or "Collections," the resolution was taken that a regular issue of the "Transactions" should be persevered in; and in some respects to insure this, the active-minded Mr., afterward the celebrated Dr. Halley, undertook, at a meeting of the Council, Dec. 7, 1692 (*vide* Weld's History of the Royal Society, vol. i. p. 326), to furnish "*de proprio*," five sheets in twenty! Although subsequent experience illustrated that, by the aid of other contributors, this unusual proportion was not really to be exacted from this zealous labourer; yet in the mind of such a man as Halley, the promise would in the interim have all the attributes of a necessity, and he would consequently omit no opportunity of pressing into the service whatever details might present themselves as suitable *points d'appui* upon which to found the fulfilment of his pledge. Accordingly the very first paper he presented to the society after this meeting of the Council was one which we have ventured to surmise was the offspring of this implied necessity of redeeming his guaranteed services as a contributor. The paper was entitled "An Estimate of the Degrees of Mortality of Mankind, drawn from curious Tables of the Births and Funerals at the City of Breslaw; with an attempt to ascertain the price of Annuities upon Lives, by E. Halley, R.S.S.," and was presented in the early part of 1693. The Society had often previously had accounts forwarded to them of the baptisms and burials of different places, and such accounts had accordingly been inserted in the "Transactions" almost without comment. But M. Justell, an old and zealous contributor, having recently sent accounts from Dr. Neuman, of Breslaw, not only of the number of births and deaths, but of the *ages* of those dying there, in the five years, 1687 to 1691, Dr. Halley immediately perceived that a very interesting paper might be founded upon such materials; but he could scarcely have conceived that in framing this paper, and thereby constructing the first Table of Mortality upon record, he was also laying the foundation of so important a science as the doctrine of Life Contingencies is now universally allowed to be. The original paper will be found in the Phil. Tr. vol. xvii. p. 596. We propose on the present occasion to merely offer a resumé of its principal contents, in such a manner as to familiarly reconstruct the Table of Mortality, by the same mode of proceeding as Dr. Halley may be presumed to have done; as suggested by the materials with which he has furnished us. We have already designated the Table of Mortality so produced as the earliest upon record, but it may be further considered as the very *fons et origo* of all those that have been subsequently offered; for however much the data and method of construction of modern Tables of Mortality may differ, their form remains the same as first proposed by Dr. Halley in 1693.

The collective numbers of births and deaths in Breslaw during the five years, 1687 to 1691, as detailed to Dr. Halley, were respectively 6193 and 5869: numbers so nearly allied to each other, that allowing for levies made for the emperor's service in his wars, or for natives of Breslaw, who might die abroad, Dr. Halley was induced to make the assumption, that the total number of the population relating to Bresla— whatever number that might be, was nearly stationary in amount .nt, it distribution, and the more so, because the occupation of the pe been favoured the supposition that the confluence of strangers would be but small. The importance of this assumption of the population being in all respects of a stationary character will be presently seen. The next step, was to compare the number of deaths at the different ages. The comparison showed that the list of deaths, after childhood, although irregular in some parts of the series, was regular in others. Dr. Halley appears therefore to have taken as his second assumption, that the numbers of deaths, at any two contiguous ages, after childhood, were also as it were contiguous in amount, or that there were no ages after childhood, that could be considered as especially favourable or fatal when compared with the mortality at ages adjacent to them. When small numbers were concerned, as for instance in Breslaw, where the total number of deaths in a year did not exceed the fifth part of 5869 or 1174 per annum, for all ages collectively from birth to 100, or about 12 per age, this assumption virtually resolved itself into the supposition that the year's deaths in Breslaw at any two contiguous ages, after childhood, would either be equal in amount, or would not differ by more than a unit from each other. Aided by this latter form of the assumption, after assigning probably from his materials the number of deaths during childhood or from 1 to 8 years of age as 145, 57, 38, 28, 22, 18, 12, and 10 respectively, he regulated the succeeding deaths, age by age, as in the following series, observing as before stated the principle of equality, or of numbers merely differing by unity for contiguous ages, commencing with 10 deaths as the number allotted to the age of 8. The lower or third line has been added to show the original numbers afforded by averaging the materials, or the numbers to which Dr. Halley applied his principle of modification to render them more regularly distributed, as they might be supposed to become, if the materials had extended over a greater number of years, as 20 in place of 5, and had included those natives of Breslaw who had died abroad.

Ages.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
Deaths.	10.	9.	8.	7.	6.	6.	6.	6.	6.	6.	6.	6.	6.	6.	7.	6.	6.	7.	7.	7.	7.	8.	8.
	11.	6.	5½.	5½.	5½.	5½.	2.	3½,	3½.	3½.	5.	6.	6.	4½	6½.	6½.	6½.	6½.	6½.	9.	8.	7.	7.

Ages.	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.	41.	42.	43.	44.	45.	46.	47.	48.	49.	50.	51.	52.	53.	54.
Deaths.	8.	8.	8.	9.	9.	9.	9.	9.	9.	9.	9.	10.	10.	10.	10.	10.	10.	10.	11.	11.	11.	11.	11.	10.
	7.	7.	7.	7.	7.	8.	9½.	9½.	9½.	9½.	9½.	8.	9.	9.	7.	7.	7.	7.	10.	•	•	•	•	11.

Ages.	55,	56.	57.	58.	59.	60.	61.	62.	63.	64.	65.	66.	67.	68.	69.	70.	71.	72.	73.	74.	75.	76.	77.	78.	79.
Deaths.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	10.	11.	11.	11.	11.	10.	10.	10.	10.	9.	8.
	9.	9.	10.	10.	10.	10.	10.	10.	12.	9½.	9½.	9½.	9½.	9½.	9½.	14.	9.	11.	9½.	9½.	9½.	9½.	6.	7.	7.

Ages.	80.	81.	82.	83.	84.	85.	86.	87.	88.	89.	90.	91.	98.	99.	100.
Deaths.	7.	6.	5.	3.											
	7.	3.	4.	4.	2.	1.	1.	1.	1.	1.	1.	1.	0.	$\frac{1}{5}$.	$\frac{3}{5}$.

Having thus arranged, as in the foregoing list, the number of deaths in relation to each age, Dr. Halley had recourse to his former assumption of the population being stationary to enable him to determine the relative number living at each age, for without the relation of the number of living to the number of dying, it is obvious that the rates of mortality would be still indeterminate. The most useful form of the assumption was to suppose the population of Breslaw so completely stationary, that the number living at any age uniformly consisted of the survivors from the preceding age, and consequently that the numbers living at any two contiguous ages, merely differed in amount by the number of deaths occurring at the younger age. The list of deaths thus became merely a list of differences, so that if the number living at any one age could be ascertained, the relative numbers at the other ages might be easily deduced by the aid of the list of deaths. The number of births being afforded, the age for which it would be most easy to deduce the number of living, would obviously be that of the year following birth, and accordingly Dr. Halley appears to have determined this number in the following manner. The total number of births in the five years being 6193, the annual number would be about 1238, and of these about 348 died at different periods during their first year of age, consequently it seemed a fair assumption, that as 1238 were born throughout the year and only 890 survived the year, that about 1000 might be considered as living *conjointly* in their first year, and thus the number from which the Table of the number of living was to commence, was deduced as 1000 in the *first current* year of age; and from this number the remainder were obtained, as in the following Table, by subtracting the number of deaths in relation to each age.

Age current.	Persons.	Age current.	Persons.	Age current.	Persons.	Age current.	Persons.	Age current.	Persons.	Age current.	Persons.
1	1000	8	680	15	628	22	586	29	539	36	481
2	855	9	670	16	622	23	579	30	531	37	472
3	798	10	661	17	616	24	573	31	523	38	463
4	760	11	653	18	619	25	567	32	515	39	454
5	732	12	646	19	604	26	560	33	507	40	445
6	710	13	640	20	598	27	553	34	499	41	436
7	692	14	634	21	592	28	546	35	490	42	427
Age current.	Persons.	Age current.	Persons.	Age current.	Persons.	Age current.	Persons.	Age current.	Persons.	Age current.	Persons.
43	417	50	346	57	272	64	202	71	131	78	58
44	407	51	335	58	262	65	192	72	120	79	49
45	397	52	324	59	252	66	182	73	109	80	41
46	387	53	313	60	242	67	172	74	98	81	34
47	377	54	302	61	232	68	162	75	88	82	28
48	367	55	292	62	222	69	152	76	78	83	23
49	357	56	282	63	212	70	142	77	68	84	20

Age.	Persons.
7	5547
14	4584
21	4270
28	3964
35	3604
42	3178
49	2789
56	2194
63	1694
70	1204
77	692
84	253
100	107
	34000
	Sum Total.

The total number of persons as thus determined, would amount, it will be seen, to about 34,000; supposing the distribution to have been in accordance with the preceding assumptions. Although it is obvious that the above Table, as thus offered by Dr. Halley, is strictly a Table representing the number of survivors at each age, yet having been constructed from what were then, and long subsequently called Bills of Mortality, use has rendered it the *jus et norma loquendi* in Life Contingencies, to designate this form a Table of Mortality. Such being the origin and nature of this earliest "Table of Mortality," the general reader may expect a closing observation as to its relation to Tables of Mortality in the present day. With respect to its form, as has already been stated, no improvement has as yet been adopted, beyond inserting the column of differences or deaths, and choosing higher numbers for exemplification. Of its two principles of construction, viz., as to the number of living being deducible from the number of deaths, by aid of the assumption of a stationary population; and as to the number of deaths at contiguous ages after childhood being allied in number; the former principle was generally prevalent in the construction of such Tables, until the appearance of Mr. Milne's Carlisle Table in 1815, but is now as generally abandoned; the latter characteristic is still operative and considered as valid in all the best Tables. On deducing the rates of mortality from Dr. Halley's Table these will be found to be considerably greater than those at present relied on, but inasmuch as the interest of money in 1693 was also considerably greater than at present, it may form an interesting conclusion to the present paper, to state the annual premiums for £100 payable at death, in relation to this first Table of Mortality, supposing a Life Assurance Company to have been instituted at the period of the Table's construction, or about 70 years before any Institution based upon a Table of Mortality, admitting distinctions of age, was really publicly established. For the sake of comparison, a similar class of results from the Registrar General's Table of Mortality for Males, as deduced by Mr. Farr from the last census and published in 1844, is added.

Age.	1693. 6 per cent.	1844. 3 per cent.	Age.	1693. 6 per cent.	1844. 3 per cent.
15	1·318	1·418	45	3·506	3·215
20	1·597	1·597	50	4·134	3·873
25	1·875	1·806	55	4·855	4·833
30	2·201	2·054	60	5·968	6·129
35	2·590	2·355	65	7·602	7·851
40	2·981	2·731	70	10·162	10·156

A comparison of the above rates, renders it scarcely an exaggeration to say, that the public might safely have availed themselves of Dr. Halley's skill and of the benefits of Life Assurance, 160 years ago, upon nearly the same terms deduced from the first Table of Mortality, and the rate of interest then current, as can now be granted to the public, with a reduced rate of mortality and a corresponding reduction in the interest of money.

E. J. F.

On the liability of the occupier of a tenement for damage done to that of a neighbour, by fire kindled through his own or his servant's negligence. By C. J. Bunyon, Esq., M.A., Barrister-at-Law.

The question as to the liabilities arising upon the destruction of property by a fire which has originated through negligence, is one of considerable importance, both to the public and to Insurance Offices; and as it appears that the vulgar notions afloat upon it, by no means tally with the law, and have, nevertheless, their origin in no less an authority than that of Sir William Blackstone, it may be a matter of interest to the readers of this magazine to investigate the subject.

By the common law, every master of a house or chamber was bound so to keep his fire as to prevent it from occasioning injury to his neighbours and others. If a fire broke out in a house and burnt the adjoining dwelling, or did other damage, the master of the house in which the fire began was liable to make compensation for the injury, and it was not necessary to prove negligence, which the law presumed. Thus, "If my fire by misfortune burns the goods of another man, he shall have his action on the case against me."—"If a fire breaks out suddenly in my house, I not knowing it, and it burns my goods and also my neighbour's house, he shall have his action on the case against me."—"So, if the fire is caused by a servant or guest, or any person who enters the house with the consent of the pater familias, but not when kindled by a stranger who enters his house against his will." And the custom extended not only to fires commencing in dwelling-houses, but also to a fire lighted in an adjoining close.* By the statute, 6th Anne, c. 31, however, after imposing a severe penalty upon a servant by whose negligence a fire occurred, it was enacted "that no action shall be maintained against any person in whose house or chamber any fire shall accidentally begin, nor shall any recompense be made by such person for any damage suffered or occasioned thereby." And this provision was made perpetual by the 14th Geo. 3, c. 78, which enacts "that no action shall be brought against any person in whose house, chamber, or other building, or on whose estate any fire shall *accidentally* begin, any law, usage, or custom to the contrary, notwithstanding." Upon this statute, then, the question arises as to the meaning of the word "accidentally," whether it was intended to alter the law in all cases where the fire is not wilful, or only in those in which the cause is unknown, or no negligence can be proved. The former appears to have been the construction generally accepted, and hence it happens that the reports are singularly barren of decisions upon this point; two modern cases have, however, occurred, by which it may be considered to be settled in favour of the latter. In one of these (Viscount Canterbury, *v.* the Attorney-General, 1 Phill. 306), which was a petition of right, the point at issue was the liability of the Crown to make good the loss sustained by the Speaker of the House of Commons upon the destruction of the Houses of Parliament, when the fire was caused by the negligence of the servants in burning the tallies in improper places. The question was discussed at length by

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* Com. Dig. Action on case A. 6, where the authorities are collected.

Lord Lyndhurst in his judgment: he remarked, "Sir W. Blackstone, in his Commentaries (Vol. I., p. 431), observes, that by the common law, if a servant kept his master's fire negligently, so that his neighbour's house was burnt down, thereby an action lay against the master, but now, he says, by the statute 6th Anne, c. 31, the common law is altered. He thus states it distinctly as his opinion, that for a fire in a dwelling-house originating in the negligence of either himself or his servant, the master is not responsible; no authority, indeed, or decision is referred to, in support of this opinion, nor does the learned author explain how this construction of the act is to be reconciled with the words, 'shall accidentally begin;' but, although this work has gone through many editions, and been subjected to much criticism, no observation that I can find has ever been made upon this passage, or any objection urged against it;" and, he added, "during a long professional life, I recollect no instance of an action having been brought to recover compensation for this species of injury, nor do I find in the books any trace of such a proceeding." The decision, indeed, in this case, turned upon another point, but there can be no doubt as to the opinion of his lordship, and that he considered the true construction of the statute and its operation upon the land to be, that the master of the house being by the common law responsible in the event of accident, and only excused by showing on his part that the calamity arose from some superior cause which he could not resist or control: the object of the legislature was to correct this anomaly, and to put the law in this respect on the same footing as the general law of the country, namely, that the party should be responsible only upon proof that the fire was occasioned by actual negligence either of himself or his servants.

This view is confirmed by the second case (Filliter v. Phippard, 12 Jurist 203), where it was held that notwithstanding the statute, an action on the case lies against the owner of a close, for negligently lighting in it a fire, which spreads to his neighbour's close; and Lord Denman, in delivering the judgment of the court, and after stating the former law, the statute, and Sir W. Blackstone's position, observed "This reason of Sir W. Blackstone's, viz. that their own loss is sufficient punishment for their own or their servants' carelessness, is not stated in the act, and must be allowed to be very far from satisfactory, because the principle on which actions are maintained is not the punishment of guilty persons, but compensation to innocent sufferers: besides, making servants punishable for fires resulting from their own negligence is no exemption of their masters from responsibility for the same faults, for fires which accidentally begin are not fires produced by negligence; it would therefore appear that Blackstone had drawn a conclusion from the enactment which it by no means sustains. It is true that in strictness the word accidental may be employed in contradistinction to wilful; and so the same fire might both begin accidentally and be the result of negligence; but it may equally mean a fire produced by mere chance, or incapable of being traced to any cause, and would stand opposed to the negligence of either servants or masters; and when we find it used in statutes which do not speak of wilful fires, but make an important provision with respect to such as are accidental, and consider how great a change in the law would be effected, and how great an encouragement would be given to that carelessness, of which masters may be guilty as well as servants, we must say that we think the plaintiff's (that is the latter) construction much the most reasonable of the two."

The result as between an insurance office and its insurer, whose property has been destroyed through the negligence of the latter or his servants, will not be in anywise to alter their relative position, as it is firmly settled that the office is still liable to make good the loss, that very negligence by which it has been occasioned being one of the principal risks to guard against which is the object of the insurance. But where the fire has spread, and other property belonging to other persons has been destroyed, many questions will arise. Thus in the case of two buildings insured in different offices, although each office will be liable to indemnify its own insurer, yet it is apprehended that where negligence has been the cause of the fire, the owner of the building in which it has commenced will be primarily liable to the owner of the other, and that even if the office should pay the claim of such lastly mentioned person, yet it will be entitled (as in the well-known case where property is fired by the sparks from a railway engine) to bring an action in his name. A corresponding equity will in like manner arise in favour of an office in which both properties may happen to have been insured, under similar circumstances. This question of negligence will of course in every case be a question for a jury to decide, as upon the proof of it the liability will altogether depend; cases, however, may be easily imagined in which the proof may be easy, although the party to be charged may be personally guiltless, as where the fire has occurred through the admitted negligence of a servant.

Hence it appears that although a man may have insured his own property to its full value, he may yet become a loser to a considerable extent, in the event of a fire occurring, by being compelled to indemnify his neighbour. Whether the insurance offices may ever choose to enforce this equity in their own favour will be a question for their own decision, and one which will probably be viewed in a mercantile rather than in a legal light; but as there is nothing to prevent a private individual from exercising the right, it may become a question whether the liability is not one which may itself be guarded against by insurance. The only obstacle indeed appears to be found in the duty, which would fall as heavily upon an insurance of this limited character, as upon those of an ordinary description. In France, where the law, founded upon the provisions of the Code Napoleon (Liv. III. ss. 1383-1384, 1733-1734) does not apparently differ in any great degree from the rules of our common law, the corresponding but much more extensive risk is, it is believed, to a very considerable extent covered by an appropriate insurance. (Toullier—Droit Civil Francais, Tome XI—211.)

Notes on the Policy of Marine Insurance, with suggestions for its revisal, and proposed forms for a new Policy. By MANLEY HOPKINS, Esq., Average-Adjuster.

> "—— Si quid novisti rectius istis,
> "Candidus imperti; si non, his utere mecum."—HOR.

IN making this contribution to the spirit of advance which is characteristic of our age, the writer is fully aware of the danger of reforms. He remembers "the grace which antiquity can lend" even "to error;" and that by an almost universal instinct the Past is consecrated in the eyes of the Present. Thus, the half-lights and imperfections of our forefathers are clung to with a generous pertinacity. We endeavour to manage with the customs and remedies which sufficed for an early state of society, rather than frame new ones to suit the exigencies of our altered condition. In fact, to speak with Scaliger, we had rather eat acorns with our ancestors than bread with the men of our own generation.

And in many things an Englishman's dislike to change and innovation is his safety. He is not sure that existing institutions will be altered by heads as wise, and hands as steady, as those which reared them; and he learns to think of the *giants* of former days, without reflecting that the dwarf seated on the giants' shoulders sees further than the giant himself.

With respect to the instrument to which his remarks particularly refer, the writer is not unconscious of some inconveniences attaching to change. The number of legal decisions which have taken place on the present Policy of Marine Insurance, and its perfect recognition in our law-courts, make it, as it were, a necessary evil, and give it a kind of *noli me tangere* privilege. Yet, when change is all in favour of greater clearness and simplicity, these obstacles are not so much to be regarded; they are no more than what are usually, but unsuccessfully, urged against all movements towards improvement. Nevertheless, it is with diffidence that the present suggestions are put forward,—not under the idea that they will be implicitly acted upon, yet with the hope that they will give rise to that proper discussion which the subject merits, and may lead, eventually, to a revision of the Policy. For it must be apparent to all, that the present instrument is full of obscurity, and that its language is in parts obsolete; and, unfortunately, it has been rendered darker by the frequent illuminations that have been lavished upon it; so much so, that in the hands of the uninitiated it is as vague as Miranda's recollections,—

> "And rather like a dream than an *Assurance.*"

It is not so much organic change that is required—though for this there is room—as perspicuity and unequivocal expression; the expungement of some contradictions, and the divarication of the Policy with reference to its two or more subjects of Insurance. As far as such a re-arrangement of its materials operates, all former precedents and judgments would remain undisturbed; they would be quoted with as much effect to establish the powers of the new Policy as of the old; and it is to be hoped that *future* decisions would be still more explicit and leading, inasmuch as they would proceed on clearer grounds of question. But to avoid litigation is a better object to have in view than to provide for all possible cases of legal interference. The Policy of Insurance is essentially an amicable bond, intended for the furtherance of security, enterprise, and the national welfare; so it should be considered, and not as has been too often the case, the fruitful ground of dispute and action,—a very "bond of disunion."

What is required, then, is a clear, simple, explicit agreement, the terms of which are mutually understood by the contracting parties, and are as unequivocal as they can be made.

With these prefatory observations, we proceed to consider the Policy more closely.

The system of Marine Insurance would appear to be an exception to most other institutions, which grow gradually from small to great —from what is rudimentary to what is perfect. It seems to have come into existence almost full-grown; or, passing rapidly through its nonage, to have arrived at a premature completeness. If its precocity produced some advantages, the system is marked with the usual evils of that precocity. The Policy, as the exponent of the scheme, once framed, was considered to be sufficient, and to be capable of no improvement,—at least, we may suppose so, from the number of years the instrument has existed in its present state; while all modern endeavours are to "explain its explanations,"—not to amend it, or construct a new formula. "It is very probable," says Marshall, "that the form of a Policy of Insurance, nearly similar to that which we have now in use, was introduced into England by the Lombards," —consequently, five or six centuries ago. The same writer almost immediately afterwards designates the policy as "extremely inaccurate, and unskilfully framed;" and Mr. Justice Buller said, "that it has always been considered in courts of law as an absurd and incoherent instrument."

It runs as follows:—

S. G. (Note 1.) In the Name of God, Amen.

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A. B. as well in *his*[*] own name, as for and in the name and names of all and every other person or persons to whom the same doth, may, or shall appertain, in part or in all, doth make assurance and cause *himself* and them, and every of them, to be insured, lost or not lost, at and from *C. to D.*, upon any kind of goods and merchandizes, and also upon the body, tackle, apparel, ordnance, munition, artillery, boat, and other furniture, of and in the good ship or vessel called the *E.*, whereof is Master, under God, for this present voyage *F.*, or whomsoever else shall go for master in the said ship, or by whatsoever other name or names the said ship (Note 2) or the master thereof, is or shall be named or called; beginning the adventure upon the said goods and merchandizes from the loading thereof aboard the said ship, *as above*, upon the said ship, &c.; and so shall continue and endure, during her abode there, upon the said, &c.; and further until the said ship, with all her ordnance, tackle, apparel, &c., and goods and merchandizes whatsoever shall be arrived at, *as above*, upon the said ship, &c., until she hath moored at anchor twenty-four hours in good safety, and upon the goods and merchandizes until the same be there discharged and safely landed. And it shall be lawful for the said ship, &c., in this voyage to proceed and sail to, and touch and stay at any ports or places whatsoever, without prejudice to this Insurance (Note 3.) The said ship, &c., goods and merchandizes, &c., for so much as concerns the assured by agreement between the assured and assurers in this Policy, are and shall be valued at

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[*] The words printed in *italics* are left blank in the Policy; they are inserted to give continuity to the form. The singular pronoun used is to imply one or more persons.

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Touching the adventures and perils which we, the assurers, are contented to bear, and do take upon us in this voyage; they are of the seas, men of war, fire, enemies, pirates, rovers, thieves, jettisons, letters of mart and countermart, surprisals, takings at sea, arrests, restraints, and detainments of all kings, princes, and people, of what nation, condition, or quality soever, barretry of the master and mariners, and of all other perils, losses, and misfortunes that have or shall come to the hurt, detriment, or damage of the said goods and merchandizes and ship, &c., or any part thereof. And in case of any loss or misfortune it shall be lawful to the assured, their factors, servants, and assigns, to sue, labour, and travel for, in and about the defence, safeguard, and recovery of the said goods and merchandizes, and ship, &c., or any part thereof, without prejudice to this Insurance; to the charges whereof we, the assurers, will contribute each one according to the rate and quantity of his sum herein assured. And it is agreed by us, the insurers, that this writing or Policy of Assurance shall be of as much force and effect as the surest writing or Policy of Insurance heretofore made in Lombard Street, or in the Royal Exchange, or elsewhere in London. And so we the assurers are contented, and do hereby promise and bind ourselves, each one for his own part, our heirs, executors, and goods to the assured, their executors, administrators, and assigns, for the true performance of the premises, confessing ourselves paid the consideration due unto us for this assurance by the assured, , at and after the rate of *per centum.*

In witness whereof, we, the assurers, have subscribed our names and sums assured in *London*, (*dated accordingly*.)

N.B. Corn, fish, salt, fruit, flour, and seed, are warranted free from average, unless general, or the ship be stranded. Sugar, tobacco, hemp, flax, hides, and skins are warranted free from average, under five pounds per cent. And all other goods, also the ship and freight, are warranted free from average, under three pounds per cent., unless general or the ship be stranded (Note 4.)

Then follow the signatures of the underwriters, with the amount undertaken by each, and the date of signing. (Note 5.)

Note 1.

S. G.—The meaning of these two initials, which stand at the commencement of the Policy, in the margin, is not known with certainty. They are supposed by some to stand only for "*salutis gratiâ*,"—"for the sake of safety;" whilst others consider them to indicate the words *ship and goods*, in reference to the form being applicable to both or either of these interests. I think the latter explanation more likely to be the correct one, particularly as the letters do not occur in an old Policy of Insurance, preserved at Lloyd's, and bearing date 1708 which is on merchandise only. In the body of that Policy, the clauses which relate specially to the ship are omitted.

This leads me at once to speak of the advantages which would be gained by dividing the Policy into as many separate forms as there are separate subject-matters of Insurance. The great inconvenience of the present instrument consists mainly in its being constructed to include two or more entirely different subjects, the nature, purposes, and particular risks of which differ as widely as ships are different from merchandize, or both from freight. The difficulty lies in having had to frame words which should include two or more several ideas; as if it were attempted to mix up and print two acts of parliament in one document. The consequence of this coalition in the Policy is, that its language is constantly interrupted, parenthetically, by matter in which a person using it for one of its objects is unconcerned: and then this gives rise to questions as to whether provisions introduced to meet emergencies in one of its characters, are not to be applied as binding in its other capacities.

Nor is the obsolete style of the words and grammar of the policy a trifling deduction from its usefulness. Persons making use of an important document, naturally wish to know the exact scope and meaning of that document. Simplicity and clearness, whether in commercial or any other affairs, cannot, I think, be overvalued; and it is quite proper that the parties to a bargain should be well acquainted with all its conditions, so that they may not afterwards meet with disappointment or loss, in having misapprehended it.

In framing a new Policy, or, to speak correctly, new Policies, regard is to be had to these two points, viz.: first, to keep separate the forms severally applicable to ship, goods, and freight, and even to provide a distinct form for ships insured for time, and those insured for a particular voyage; secondly, to reduce the language used, to as simple and lucid a kind as can be attained whilst accomplishing the objects of the Policy.

NOTE 2.

"*Or by whatsoever name or names, &c.*"—Though this permission is retained in the Policy, it is of no value, since, by the Registration Act, it is made illegal, under a penalty of £100, to alter, erase, or obliterate a ship's name, or to describe her in any document by any name other than that by which she was first registered. The continued use of such expressions, both printed and written, when their force has been extinguished, is very objectionable. The Policy should be encumbered with no clauses permissive or restrictive, that are not meant.

NOTE 3.

"*And it shall be lawful for the said ship, &c., in her voyage,*" *&c.*—The mischievous tendency of these lifeless traditions is strongly exemplified in the clause giving an unbounded licence in sailing. The present Policy recites that "it shall be lawful for the said ship, &c., in this voyage to proceed and sail to, and touch and stay at any ports or places whatsoever, without prejudice to this Insurance." And it is very customary to insert in writing after the word "whatsoever," "and wheresoever." Now what could be more full and distinct than this unlimited permission? yet what is the practical fact that meets us *in limine?* Why, that the *slightest deviation* from the intended voyage vitiates the Policy. And this large warrant is reduced to a simple allowance, that if the vessel meet with an accident, or should be in want of water and provisions, &c., she may resort to a port to repair, or to obtain the necessaries she requires. There is nothing to object to in strictly limiting a voyage—on the contrary: but there is everything to object to in continuing a form of words which must be understood in a non-natural sense, where

"*Less* is meant than meets the ear,"

or which else mean nothing at all.

NOTE 4.

"The Memorandum."

I propose in suggesting a new form of *Ships'* Policy, to omit the exception in favour of stranding, contained in the warranty of the present instrument, and in giving my reasons for this, in a few words, I hope to make the futility of the clause plain and justify its expungement.

It scarcely admits of a doubt that when the word "stranding" was first employed in the Policy, it had a very distinctive meaning: that it was instanced for a type of such great and notorious causes of damage as would set aside all questions about the propriety of a claim on the insurers. By "stranding" was intended the casting of a ship on shore, or her lying on rocks in such a manner as that great and immediate injury would accrue to her, if not entire destruction. But time and use interfere with original intentions. In a multitude of cases, approximating more or less nearly to the written letter, it is very difficult to draw the line of distinction; it is very difficult to say, "this case fulfils the necessary conditions,—this does not." Mental ingenuity quickened by men's particular interests, causes refinements to be made upon what were once plain words, so that on a retrospect we become aware that we have departed from the primitive notion, while the declivity has been so gradual, that we cannot tell at what point we should have stopped and said "no further." This has happened remarkably in the case of the word "stranding." No longer is that word the expression for "great damage received by a ship in consequence of striking or lying on a shore, rocks, and the like," but we have had it laid down in law, that if a ship's course through the water be stopped, the shortest space of time, say one minute, by touching on sand or rocks, or the side of the river, &c., that *is* a stranding within the meaning of the Policy; while on the other hand, though a vessel should plunge down on a sharp rock in a violent sea and stave in her bottom, or should beat over a whole reef, tearing off her keel, and doing herself most extensive damage, yet, her course not being actually stopped, and the vessel being water-borne,—that is not a stranding, so as to give the benefit of the exceptional warranty. Now, without stopping to enquire into the justice or propriety of such distinctions, it will be sufficient to shew the ground why stranding should be omitted from a Ship's Policy.

If a vessel by resting or striking on the ground or rocks receive no more damage than can be repaired for a sum under 3 *per cent.* on her value, it is clear that the cause of her damage is not of that violent nature which the primitive meaning of the word *stranding* suggests to the mind. In fact, the cause of damage is no greater than other frequent accidents a vessel meets with in her navigation from boisterous weather, in which she splits her sails, carries away her bulwarks, but which damages might all be repaired at something under 3 per cent. on the ship's value, and are therefore not recoverable on a Policy. Nay, the ordinary wear and tear during a voyage to her painted work, her running rigging and small stores, would require a sum to reinstate the ship in the same condition as when she commenced her voyage, little short of 2 out of the 3 *per cent.* on her value. There is no reason, then, why that small amount of damage (less than 3 per cent.) should be admitted *because* a vessel has been nominally stranded, since it is clear that she has suffered no more injury by a *stranding* than she might have met with from the ordinary events of a voyage, the usual bad weather she encounters, and the wear and tear which necessarily attend her navigation. The deduction on the other hand is most plain, that if a vessel meet with serious injuries, such as *exceed* 3 per cent. on her value, the exceptional warranty is useless, because the claim for repairs stands good without it.

NOTE 5.

This note refers rather to unwritten customs, by which certain clauses of the Policy are construed, and affects the practice more than the letter; yet as a certain practice is known to exist for the arrangement of claims against insurers, and an agreement is implied when an insurance is effected to abide on both sides by such practice—"the custom of Lloyd's"—the present appears to be a fit place for considering some particular regulations which have grown up, and which might, if considered advisable, be changed along with the alterations to be effected in the Policy itself. A few remarks, therefore, will not be out of place respecting certain losses and damages, by custom rejected by insurers.

The principal of these are the parting of chain and hemp cables; the carrying away of sails during gales; the upsetting and destruction of windlasses by heavy riding in tempestuous weather; the loss of hawsers and some other materials and stores by their being washed off deck.

The manner of dealing with the losses just specified, require consideration. It is not affirmed that all such should be indiscriminately admitted by Insurers, as a matter of course: because it frequently happens that the above mentioned articles are lost by ordinary wear and tear, and in cases where due caution would have prevented the loss; but I think that there is not a *primâ facie* ground against their being allowed by underwriters; nor should they be uniformly classed as "wear and tear," and in consequence placed to the owner's cost. The rejection of such losses must proceed upon one or two grounds, either that underwriters never undertook the risk of the articles lost, or that custom relieves them from responsibility in case of their loss.

As to the first ground:—A sail, a chain, an anchor, a windlass, are as much integral parts of a "ship," as are bulwarks, paint, copper, spars, &c. An owner makes no "proviso" with an underwriter, that these portions of his vessel shall not be insured:—if it were so, he (the owner) would have the right to deduct their value in a case of wreck and salvage, from the general proceeds. Indeed, the above specified articles are of most vital importance to the ship's safety, and to the safety of the lives, cargo, and freight accompanying the ship in her destiny. It is not every sail or every cable, however, which should be charged to underwriters, for unfortunately many ships are ill-found, and continue to use sails, cables, &c., beyond the time when they are safe, and then the first breeze or plunge carries them away. But on the other hand, it is to be seriously maintained that there are occasions when no strength of materials can withstand the enormous force of the elements. There are occasions when something must give way, either the windlass, or the chain, or the anchor; or the ship must be submerged and founder. Nothing but miraculous chains and supernatural windlasses could secure insurers from their loss in some cases; and if they did hold, there is still the other horn of the dilemma, viz., the sinking of the ship itself. Something of a similar nature might be said of sails. It is stated that the purpose of sails is for them to be set; and if, during their use, the wind carries them away, it is a danger to which they are ordinarily and necessarily exposed; that it is "wear and tear," and in fact the concern of the owner alone. Now, there is something true in this argument, and there is also something erroneous. The same reasoning might be applied to other materials and parts of a ship, and to the whole ship itself. It is the part of bulwarks to be exposed to the waves, to keep them off the deck; yet when they are split or knocked away by those waves, they are admitted as part of an Average claim. It is the ship's proper service to sail from port to port, and in so sailing to encounter winds and seas and dangers; but if the using of a thing about its proper service took it out of the indemnity granted by a Policy whenever it was injured in that service, why no claim at all could ever arise, and the whole system of Insurance would be at an end.

The other ground is that of Custom. Against this it might be urged in the words of Lord Kames, that "Custom ought to have no weight when inconsistent with equity." But to this would be replied, that the practice has long been submitted to, and that it is competent with persons insuring to introduce any special clauses into their Policy, and underwriters to agree to them upon consideration of an additional premium. We must, therefore, look for an answer in the nature of the thing itself, arguing, as it were, from congruity, and looking to the objects of insurance so as to give the subject the fulness and completeness it is capable of; and as the end of Insurance is to indemnify him who insures against loss incurred by perils of the seas; and as the losses now spoken of do certainly arise from those perils, whatever secondary code custom may have established, the losses primarily are at the responsibility of the insurers; and therefore it appears to me, on the whole, to be better to demand such a remunerative premium as shall make the system of Insurance *complete*, than to sell a *partial* indemnity at a smaller price. Better for the shipowner I consider it to be, because for a small addition in premium he has procured his required object, that is, freedom from contingent loss and certain anxiety, a *bonâ fide* indemnity:—better for the underwriters, inasmuch as it is bringing them an increase of business; for it matters not in trade whether one sells more of an article by increase in number or by superiority of kind.

Perhaps some middle course might be adopted, founded on the facts and equity of the case, such as to afford a more perfect indemnity, yet not so as to encourage negligence or bad ownership. There are, indeed, such nice shades of difference constantly arising in practice—differences in degree as well as in kind, that it requires the judgment of a disinterested person to decide on them; thus the average adjuster's office is really judicial, and not, as some imagine simply one of routine. Precedents indeed exist, but they are not always apposite, or always to be pleaded for or against the admission of charges in a statement. "The law of cases of necessity is not likely to be well furnished with precise rules: necessity creates the law, it supersedes rules; and whatever is *reasonable* and *just* in such cases, is likewise legal."

To reduce all such doubtful cases, however, to the smallest number, to render the relative positions of the two contracting parties as intelligible and explicit as possible, should be the object of those upon whom it eventually devolves to frame a new Policy of Insurance. Uncertainty may, in some cases, be the mother of profit; but it is profit to the few and loss to the many, whilst order, clearness, and good faith cannot be adhered to without ensuring convenience and safety to all.

Appendix, No. 1.

Proposed form of Policy on Ship for general use, exclusively of "Time Risk," the form of Policy for which is given in the following Appendix.

By this Instrument, or Policy of Insurance, it is acknowledged that we, whose names are written at foot, have received from [A or B,] on our own behalf (or as Agents), the sum of Pounds, Shillings, and Pence; say £ , being at the rate of per centum.

In consideration of which sum or premium we do hereby, each separately and for himself,* insure and indemnify, the said [A or B,] to the extent, in the manner, and in respect of the property following:—namely,

Amount Insured,

Pounds; say £

Subject Matter.

On the Ship or Vessel " ," of the burthen of Register Tons; at present commanded by [C or D.] Being on her Hull, Masts, Rigging, Sails, Permanent Stores, and Stores of Provisions, &c., for use during her voyages: the whole Ship being valued, as far as concerns this insurance, at £ .

Limitations of Voyage. From [A to B,] , with liberty to call at . And at all other ports or places in case of necessity; but not for the purpose of trade, or of procuring additional freight. This Insurance takes effect when the vessel weighs anchor and commences her voyage; and ceases when she has been moored twelve hours at her final port.

Risks Insured against.

1. From Total Loss.
2. From Partial Loss, also called Particular Average; provided that the repairs, after deducting one-third part from the labour and new materials, amount to three per cent. on the Ship's declared value. But in case of the Ship's age not exceeding twelve months from the date of the register, the third is not to be deducted. It is also provided that in

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* The last five words need not be introduced when the Policy is used by a Company.

ascertaining the above-mentioned three per cent., the accessory charges for Surveys, Documents, &c., shall not be included.

3. From the Ship's contribution to sacrifices made, or expenses incurred for the joint benefit of Ship, Cargo, and Freight, called General Average.

4. From (Here insert any special risk undertaken; such as *restitution for damages* done *to other vessels* by being *run down* or *injured by the Ship insured*).

The said A or B is indemnified from the foregoing losses and expenses, whether they arise from tempestuous weather, fire, stranding, striking on rocks or wrecks, pirates, enemies, misconduct of the masters and mariners (called Barratry), or any other perils incidental to navigation which the prevailing custom of Great Britain pronounces to attach to Insurers.

EXCEPTIONS. But the said [A or B] is not insured against any loss, damage, or expenses arising from the unseaworthiness or insufficiency of the the Ship, inherent defects, overloading, carriage of deck-cargoes out of season, ignorance, or incompetence of the master; or the consequences of such causes.*

METHOD OF ADJUSTING AND SETTLING LOSSES.—And in case any claim for loss or damage, not amounting to a total loss, arise on the Policy, the quantum of our liability in respect of such loss or damage, shall be ascertained by professional persons called Average Adjusters; unless such claim be mutually agreed by the Insurers and the Insured. And should the statement of the Average Adjuster not be conclusive, or be objected to, such claim shall be referred to Arbitrators mutually appointed, or shall be decided in the Courts of Common Law.

SIGNATURES AND DATE.

Signed in , this day of , in the year 185 .

Appendix, No. 2.

The form of Policy on Ship when for time, is the same as the previous form, with the exception of the following clause, which takes the place of that entitled *Limitations of Voyage*:—

DURATION OF RISK.

From noon of the day of , 185 , until noon of the day of , 185 .

Appendix, No. 3.

Proposed form of Policy on GOODS.

BY THIS INSTRUMENT, or Policy of Insurance, it is acknowledged that we whose names are written at foot, have received from [A or B,] acting on their own behalf (or as Agents), the sum of Pounds, Shillings, Pence; say £ , being at the rate of per centum. In consideration of which sum or premium we do hereby each separately and for himself,* insure and indemnify the said [A or B,] to the extent, in the manner, and in respect of the property following :—namely,

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* It were much to be wished that deck-cargoes could be altogether abolished. They necessarily tend to raise the centre of gravity in respect to the centre of flotation, and consequently, to destroy the stability of the ship's equilibrium; they cumber the deck, and place obstacles in the way of manœuvring, and are themselves, from their situation, an unsafe venture. The Legislature very wisely restricted the legality of carrying deck-loads within certain seasons. The custom of taking them is so general that it would, perhaps, be now scarcely possible altogether to abolish them, but very stringent conditions ought to be imposed on their use.

AMOUNT INSURED,

Pounds, say £

SUBJECT MATTER.

On (here are to be written the marks, numbers, qualities, and description of the goods insured.) Which are valued, as far as concerns this insurance, at £

DURATION OF RISK.

From the time the goods are received on board the said ship, till they are landed at their port of destination, and including all risk of craft at shipping and landing.

Liberty is given for the ship to call at , and at all other ports and places in case of necessity, but not for the purpose of trade, or to procure additional freight.

RISKS INSURED AGAINST.

1. From Total, Loss.

2. From Salvage Loss, *i.e.* when goods are sold on account of sea-damage at any port or place short of their destination. *Note.* Corn and other articles specified below as free from partial loss, unless stranded, when shipped in bulk are not claimable as a salvage loss, unless the whole bulk has been sold at an intermediate port.

3. From Partial Loss, also called Particular Average; under the following conditions:—That the loss arrives at or exceeds three per centum (unless the Ship be stranded), on the value of all the goods except those hereafter specified, namely—

Sugar, tobacco, hemp, flax, jute, hides and skins, on which the loss must amount to or exceed five per centum, unless the Ship be stranded.

Corn and seed,† fish, salt, saltpetre, fruit, potatoes, flour, on which partial loss is not claimable unless the Ship be stranded.

And in case of stranding claims for partial loss on all the above articles, are to be paid without reference to the per-centage of loss.

4. From contribution to sacrifices made, or expenses incurred for the joint benefit of ship, cargo, and freight, called General Average.

5. From special charges on cargo in a port of distress.

6. From [ ]. (Here insert any special risk undertaken.

The said A or B is indemnified from the foregoing losses and expenses, whether they arise from tempestuous weather, fire, stranding, striking on rocks or wrecks, pirates, enemies, misconduct of the master and mariners (called Barratry), or any other perils incidental to navigation, which the prevailing custom of Great Britain pronounces to attach to Insurers.

EXCEPTIONS.

But the said [A or B] is not insured against any loss, damage, or expenses arising from the unseaworthiness or insufficiency of the ship, inherent defects, overloading, carriage of deck cargoes out of season, ignorance or incompetence of the master, or any consequences of such causes.

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* These last five words are not to be introduced when the Policy is used by a company.

† N.B. By corn and seed are meant all descriptions of these articles in which the germinating power continues. When that is destroyed by any process before shipment, the product is not excluded from claims for partial loss.

METHOD OF ADJUSTING AND SETTLING LOSSES.

And in case of any claim for loss or damage, not amounting to a total loss, arising on this policy, the quantum of our liability in respect of such loss or damage shall be ascertained by professional persons called Average Adjusters, unless such claim be mutually agreed on by the insurers and the insured. And should the statement of the Average Adjuster not be conclusive, or be objected to, such claim shall be referred to Arbitrators mutually appointed, or shall be decided in the Courts of Common Law.

SIGNATURES AND DATE.

Signed in , this day of in the year 185 .

Appendix, No. 4.

Proposed form of Policy on Freight.

By this Instrument or Policy of Insurance it is acknowledged that we, whose names are written at foot, have received from A or B acting on their own behalf (or as Agents), the sum of pounds, shillings, pence; say, £ , being at the rate of per centum.

In consideration of which sum or premium we do hereby each separately and for himself,* insure and indemnify the said [A or B] to the extent, in the manner, and in respect of the property following; namely,—

AMOUNT INSURED.

Pounds; say, £

SUBJECT MATTER.

On freight:—the whole freight being valued, as far as concerns this insurance, at £

DURATION OF RISK.

From the time the ship begins to load her cargo until it be discharged at the port of destination, and including all risk of craft at shipping and landing.

Liberty is given for the ship to call at and at all other ports and places in case of necessity, but not for the purpose of trade or to procure additional freight.

RISKS INSURED AGAINST.

1. From total loss.
2. From salvage loss, *i. e.* where goods are sold on account of sea damage at any port or place short of their destination; provided that the loss amount to three per cent. on the insured value, unless the ship be stranded.
3. From partial loss, also called particular average, provided it amount to three per cent. on the value, unless the ship be stranded.
4. From contribution to sacrifices made, or expenses incurred for the joint benefit of a ship, cargo, and freight, called general average.
5. From expenses incurred in carrying on a cargo to its port of destination, when the ship is unable to proceed, by which means the freight is secured.
6. From special charges on freight in a port of distress, such as reloading cargo.

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* These last five words are not to be introduced when the policy is used by a company.

7. From [*Here insert any special risk undertaken.*]

The said [A or B] is indemnified from the foregoing losses and expenses whether they arise from tempestuous weather, fire, stranding, striking on rocks or wrecks, pirates, enemies, misconduct of the master and mariners (called Barratry), or any other perils incidental to navigation, which the prevailing custom of this country pronounces to attach to Insurers.

EXCEPTIONS.

But the said [A or B] is not insured against any loss, damage, or expenses arising from the unseaworthiness or insufficiency of the ship, inherent defects, overloading, carriage of deck cargoes out of season, ignorance or incompetence of the master, or any consequences of such causes.

METHOD OF ADJUSTING AND SETTLING LOSSES.

And in case of any claim for loss or damage not amounting to a total loss, arising on this Policy, the quantum of our liability in respect of such loss or damage shall be ascertained by professional persons called Average Adjusters, unless such claim be mutually agreed by the insurers and the insured. And should the statement of the Average Adjuster not be conclusive, or be objected to, such claim shall be referred to Arbitrators mutually appointed, or shall be decided in the Courts of Common Law.

SIGNATURES AND DATE.

Signed in , this day of in the year 185 .

Maritime Risks.—Statement of Collisions, extracted from Lloyd's List for the years 1845 *to* 1849 *inclusive.* Prepared by JOHN A. RUCKER, Esq., Underwriter to the Corporation of the London Assurance.

IN availing ourselves of the permission, which has been kindly accorded to us by Mr. Rucker, to publish the Statement which he has compiled with so much labour and skill, we cannot but draw the attention of our readers to a collection of facts on a subject on which very little authentic information has yet been made public. The author has brought together, for each of the years in the Statement, the facts under the different heads distinguished below; but as the object of this publication is rather to deal with the averages of results, and the number is scarcely sufficient in each year and under each head to form a fair standard of comparison, it has been deemed sufficient to reprint merely the general summary for the five years together, and to add the proportions per cent. so as to allow of some general means of comparing the totals together. With these and with Mr. Rucker's explanatory notes, this curious subject is left for the consideration of those whose pursuits may lead them to take an interest in similar enquiries, or whose experience may enable them to appreciate their value. It is hoped, indeed, that the publication may induce others to add to information on a topic so rarely touched upon, and yet so well worthy of the attention of the statist and the practical man of business.

Totals of Collisions, extracted from Lloyd's List for the five years 1845 to 1849 inclusive.

MONTHS.	Number of Collisions in which a Steamer was in contact with a Sailing Vessel.	Number of Collisions in which one Steamer was in contact with another Steamer.	Total Number of Steamers in Collision.	Total Number of identified vessels, including Steamers, in Collision.	Number of Steamers not identified in Collision.	Number of Sailing Vessels not identified in Collision.	Total number of Collisions extracted.	DAMAGED. Sunk, run down, abandoned, &c.	Seriously.	Considerably.	Slightly.
Jan. -	21	3	27	358	2	83	220	40	21	82	217
Feb. -	9	- -	9	274	1	75	175	23	20	67	165
March -	18	2	22	278	4	62	172	20	16	72	175
April -	16	3	22	210	8	60	133	27	14	49	131
May -	7	2	11	146	1	51	99	13	6	33	95
June -	5	1	7	124	- -	38	81	11	4	22	87
July -	10	1	12	159	2	42	101	10	17	27	107
Aug. -	11	3	17	199	4	45	124	24	11	46	123
Sept. -	8	3	14	238	1	67	153	12	17	59	151
Oct. -	20	4	28	332	5	71	203	28	25	68	216
Nov. -	27	2	31	316	8	96	209	26	19	77	204
Dec. -	18	4	26	382	4	100	243	45	19	84	239
	170	28	226	3016	40	780	1913	279	189	686	1910

Classification of Damage. Totals of five years, 1845 to 1849 inclusive.

Description of Vessels.	Total.	Proportion per cent.	DAMAGED. Sunk, run down, abandoned, &c.	Proportion per cent. of each class.	Seriously.	Proportion per cent. of each class.	Considerably.	Proportion per cent. of each class.	Slightly.	Proportion per cent. of each class.
Steamers in contact with Steamers.	56	1·83	4	7·14	6	10·72	11	19·64	35	62·50
Steamers in contact with Sailing Vessels.	170	5·55	5	2·94	3	1·76	7	4·12	155	91·18
Sailing Vessels (identified) in contact with Steamers.	168	5·48	24	14·28	23	13·69	56	33·34	65	38·69
Sailing Vessels in contact with Sailing Vessels (identified.)	1888	61·62	179	9·48	105	5·56	348	18·43	1256	66·53
Sailing Vessels in contact with Sailing Vessels (not identified.)	774	25.26	59	7·62	52	6·72	264	34·11	399	55.55
Unidentified Vessels sunk ..	8	·26	8	100·						
Total	3064	100·	279	9·10	189	6·17	686	22·39	1910	62·34

It thus appears, that out of 100 accidents above reported, 86·88 per cent. were of sailing vessels in contact with sailing vessels; 5·48 per cent. were of steamers in contact with sailing vessels; and 7·3[illegible] per cent. were of steamers in contact with either steamers or sa[illegible]ence vessels. Of sailing vessels in contact with sailing vessels (identified and not identified), 238 out of 2,662, or 8·94 per cent., were *sunk, run down, abandoned, &c.*; and 157 out of 2,662, or 5·90 per cent., were *seriously damaged.* Of steamers in contact with sailing vessels, only 2·94 per cent. were *sunk, &c.*, and 1·76 per cent. *seriously damaged;* but of steamers in contact with steamers, 7·14 per cent. were *sunk, &c.*, and 10 72 per cent. *seriously damaged.*

The chance therefore of sailing vessels, in contact with each other, being *sunk, &c.*, is greater than that of steamers, in contact with each other, in the proportion of 8·94 to 7.14 or $1\frac{1}{4}$ to 1; but the chance of sailing vessels, in contact with steamers, being *sunk, &c.*, is greater than if they had come in contact with sailing vessels, in the proportion of 14·28 to 8·94 or $1\frac{6}{10}$ to 1. On the other hand the chance of steamers being *sunk, &c.*, if they come in contact with each other, is greater than if they had come in contact with sailing vessels, in the proportion of 7·14 to 2·94, or more than $2\frac{4}{10}$ to 1.

Note I.—The damages shown in this list having been assumed from the nature of the reports in Lloyd's List, it should be observed :—

1st. That whenever by stress of weather a vessel had parted from, or had been compelled to slip from her anchors, and in consequence thereof had been in contact with another vessel; also when a vessel at anchor had been driven foul of another vessel at anchor; such collisions have been excluded from this Statement.

2nd. That except in the case of vessels reported to have sunk, sailing vessels, not identified, are not included under any of the heads as damaged.

3rd. That all identified sailing vessels, and all unidentified steamers, which are simply reported as having been in contact, are included with those that are *reported* as "slightly damaged."

4th. That all vessels which (having lost important spars) have been *assisted into port*, are included with those that are otherwise reported as "considerably damaged."

5th. That of the vessels classed as "seriously damaged," 31, or one-sixth part, were sunk or abandoned, and after raised or brought into port, derelict, &c.

6th. That sailing vessels, not identified, reported to have sunk, are included under the head of "sunk, &c."

Mem. There were nine collisions in which both vessels sunk.

Note II.—In the course of the five years there were,—

6 steamers in contact with unidentified sailing vessels.
4 reports with three sailing vessels each.
1 report with four sailing vessels.
1 do. with three vessels, viz., one steamer and two sailing vessels.
1 do. with four vessels, viz., one steamer and three sailing ve sels.
1 do. with three vessels, viz., two steamers and one sailing vessel.
N.B. The two steamers classed "in contact together," the sailing vessel as "in contact with steamer."

and 8 unidentified sailing vessels sunk, which will correct any apparent discrepancy on a comparison of the figures in the above Statement.

Note III.—H.M. ships and steamers. There are four instances of H.M. ships and eleven of H.M. steamers being in contact with other vessels; also one instance of collision between two of H.M. ships, and one between two of H.M. steamers.

Note IV.—The number of vessels registered in the United Kingdom on the 31st December, 1844, was 23,253
Ditto Ditto 31st December, 1849, was 25,071
And of the 591 identified vessels in contact in 1845 .. 428 are recognised as British vessels.
556 Ditto in 1849 .. 416 Ditto.

Note V.—Of the collisions above enumerated,—
164 in 1845, and 142 in 1849, occurred in the English and Irish Channels and parts adjacent.
138 in 1845, and 134 in 1849, in the North Sea.
34 in 1845, and 31 in 1849, in the Baltic and Mediterranean, including the Categat and Straits of Gibraltar.
46 in 1845, and 33 in 1849 in other parts.

Inasmuch as a reluctance to report accidents of this character is induced by the law that renders the owner responsible to the extent of the value of his ship and her freight, for any damage occasioned to another vessel by the negligence or want of nautical skill of the captain and crew, many collisions are probably never reported at all. The foregoing Statements must therefore be considered with due attention to this circumstance.

Foreign Intelligence.

FRANCE.—*Life Assurance Companies in France.*—It is worthy of remark that the Assurances of Sums payable on the death of the party assured were the kind first introduced into France; and though they have not increased so rapidly as might be expected, they have nevertheless made a very steady progress. Assurances of deferred sums or survivorships, however, though in most cases they only bear date so recently as 1841, have met with a much greater portion of public favour, and were beginning to be still more rapidly multiplied, when they met with a temporary check in consequence of the events of 1848. M. Dubroca, the talented author of the *Revue des Assurances*, in his last number, enters into some enquiry into the cause of the different estimation in which the two classes of Assurances were held, and he concludes that there is no reason to be given but the negligence of the Companies themselves. Even in 1846 there were only three Companies which granted Assurances payable on death, and although their business was conducted with honour and good faith, their agencies were few, and by no means zealously supported. Assurances payable during the lifetime of the party assured, however, were advocated with so much activity and eloquence, that within five or six years nearly 400,000 policies were granted, assuring sums of nearly 400,000,000 fr. (£16,000,000—average £40 each.) The enterprising spirit which could accomplish so much in so short a time, is evidently capable of being diverted into the neglected channel of Assurances payable on death, with no less advantage to the French public than to those existing Proprietary French Companies which may be disposed to adapt themselves to the required changes, and allow the assured to participate in a share of the profits, as in the Mixed Companies in Great Britain. If not, it is probable that some of the British Companies may take advantage of so favourable an opportunity for opening up a new field for enterprise, and making use of the agency of one or the other established Companies in France, either Fire or Life, commence operations amongst a people whose remarkable energy, when once directed to a useful object, may be judged from the fact that within the short period of 30 years they have, in the business of Fire Insurance, far outrivalled Great Britain, with all her boasted spirit, activity, and resources in upwards of 100 years. The greater part of the Fire Insurance Offices in France have been established since 1819, and within that recent period the business has been so actively pressed, that the sums insured against Fire in the year 1848, by 14 Proprietary Companies in France, amounted to nearly £929,000,000 sterling, and including the Mutual Companies, to £1,320,000,000 sterling; whilst the total in the same year, insured by 62 Companies in Great Britain and Ireland, was only £811,000,000. The total sums insured by the five oldest Companies in France, established only between the years 1819 and 1829 were nearly £631,000,000, whilst the six oldest Companies in England, established between 1696 and the end of 1720, give returns amounting only to little more than £243,000,000. This is sufficient proof that the neglect in France of Life Assurance as practised in England, can arise from no lack of energy or enterprise, but only from the French public not having yet had their attention turned to the advantages which are here so much more fully recognized.

The following Table, taken from M. Dubroca's work before referred to, shows the general position of the Tontine Associations in France, from 1841 up to the 31st December, 1849, with the number of policies, the amounts assured, the total of their investments, and the annual income arising therefrom.

Names of the Associations.	Number of Policies.	Amount of Ditto.	Total Investments.	Annual Income from Ditto.
		£	£	£
La Caisse Paternelle	57,276	3,107,792	1,116,514	52,078
La Nationale....................	18,632	1,823,935	934,222	42,398
La Prévoyance	59,268	2,326,559	646,317	29,629
L'Equitable	61,030	2,292,257	545,558	25,322
La Caisse des écoles et des Familles	54,628	1,750,324	536,014	25,045
La Providence des Enfans	25,066	915,119	367,501	17,021
La Concorde	21,659	799,027	250,605	12,033
L'Economie	30,642	1,011,148	203,455	8,619
La Minerve	44,667	1,058,358	169,187	8,063
Le Conservateur	8,707	232,457	70,789	3,444
L'Européenne	4,909	184,202	54,814	2,555
L'Urbaine	2,386	124,224	21,658	969
Le Phénix	1,587	98,084	26,321	1,167
La Providence	1,986	89,324	26,802	1,354
Le Soleil..................	928	31,671	4,332	182
La France	1,320	50,878	10,284	542
La Mélusine	283	9,253	2,217	109
L'Aigle	341	12,833	1,661	65
	395,315	15,917,443	4,988,251	230,590

Government tax proposed to be levied on the French Fire Insurance Companies for the Corps of "Pompiers."—It has recently been proposed to levy a tax of 1 centime per 1000 fr. of sums insured against Fire in

France, to be applied to the corps of Pompiers. Assuming the amount of Insurances to be about the same as in 1848, this tax would amount to 230,000 fr. (£9,200) from the Proprietary Companies, and about 70,000 fr. (£2,800) from the Mutual Company, together about £12,000 per annum. It is computed that the annual losses sustained by these Companies amount on the average to 15,000,000 fr. (£600,000), and the reports of the various Companies show, that for the last 20 years the average of each loss was about 1000 fr. (£40), and the average number of losses about 15,000. Consequently such a tax would for every loss require a contribution of 20 fr. (16s.) from the Companies, and the imposition of the tax was accordingly resisted by them on the ground of its being inadequate, if intended to encourage the zeal and devotedness of that valuable body of men for the safety of the public, since the rewards which were already offered freely to all citizens were at the least 25 fr., and frequently 500 fr., whilst occasionally even 1000 fr. had been granted, according to the importance of the service rendered. It was also contended that such a tax would be unjust, because as there were 37,000 communes, and only 7000 which possessed the advantage of the Government service of "pompes" and "pompiers," and more than half of these in which the organization of the corps was worse than useless; it was in fact obliging the Companies to pay for assistance which they never received, and so far depriving them of the means of recompensing those whose services were really valuable. In fine, it would be to lay a tax upon the provident members of society and compel them to pay more than their share to save the improvident from loss. To show how the efficiency of the corps varies in different places, it is pointed out that in Paris, where the houses are almost always panneled with wood, the premium for Insurance is only 15 to 20 cents. per 1000 fr. (4d. to 5d. per £100); at Lyons, where the houses are mostly built of granite, and with stone staircases up to the top, the premium is about double; and at Marseilles, where the houses are constructed in a similar manner as in Lyons, but with the additional advantage of the floors being covered with tiles instead of wood, the premium is so high as 50 cents. per 1000 fr. (1s. per cent.), the difference depending entirely on the superior organization of the service of the "pompiers" in the first as compared with the other two places. These reasons or others appear to have had weight with the Commission charged to examine the measure, and they decided to reject the proposition.

BELGIUM.—*Report on Government Insurance.*—It appears from the official Reports, that for more than three years a very important subject has occupied the attention of the Government or the Minister of Finance in Belgium, being no less than whether the State should undertake a general system of Insurance for the kingdom, or leave it to the enterprize of individual capitalists, or companies. It was represented that the profits arising from Insurance were so great, as to afford a large and increasing revenue from these sources, without the odium of direct taxation, and with great advantage to the people. On the 27th December, 1846, a Special Commission was appointed to enquire into the ministerial project, and the Commission appeared disposed to favour the adoption of these views. Accordingly, notwithstanding a change in the ministry in the department of Finance, (the new minister, M. Veydt, not being deemed so eager for state monopoly as M. Malou who preceded him), a project of law was adopted by the Commission, at the end of the year 1847, in the first article of which it was proposed that "a general system of Insurance against fire, hail, and mortality amongst cattle, should be undertaken by the State."

But the Commission had omitted to enquire at what cost to the public treasury such a law could be carried into effect, or whence the profits were to arise, which some had ventured, without information, to set at so high a figure as £400,000. The Minister of the Interior, therefore, referred the subject to the Central Committee of Statistics, and the Minister of Finance, in like manner, engaged in the enquiry the services of able and experienced men in his department. The result has been, that the question is finally disposed of by the rejection of the plan as a State measure. The report of M. Frère-Orban, the Minister of Finance, founded on the information thus obtained, would be well worthy of a complete translation, containing, as it does, a full examination of the relative advantages and disadvantages of such a scheme. The subject deserves the greater attention as a somewhat similar project was entertained, about two years since, in France, and only repelled by the determined opposition of the Companies, and the talents, experience, and energy of M. Dubroca, who was chosen on that occasion to represent their interests. The Report of the Belgian Minister is of too great a length to be produced *in extenso*, but some of the facts and figures, and the reasonings, will be useful for future reference, and for exhibiting the present state of Insurance in Belgium.

At the first meeting of the Commission, M. Malou, the President of the Commission, estimated the net produce of the Insurances to the State at about £160,000; but M. Orban contended that to obtain such a net revenue, the gross produce should be £400,000 at least. Several writers, considered as of some authority, computed that from £200,000 to £400,000 was by no means an improbable revenue, and in one paper, to which the minister appears to attach some credit by quoting it, the Government is recommended to consider the last amount as the minimum, and that even £800,000 would not be an exaggerated probability. These discrepancies had induced him to confide to a Commission, composed of the heads of various departments—men whose names and stations are a guarantee of their fitness for the duties imposed upon them—a thorough investigation of the question in all its bearings, but especially as to the financial part which had been most imperfectly considered in previous enquiries.

The former Commission had admitted into their Report the question of Insurance against fire, hail, and the mortality of cattle. The Insurances against fire might be further distinguished under the heads of buildings, furniture, merchandize, and crops after they are removed from the ground and placed in granaries.

The Insurance of merchandize and gathered crops he considers must be placed out of the question of State enterprize for various reasons, amongst which he enumerates the uncertainty of finding suitable agents to estimate their value, or the difficulty in the mode of valuation of a large warehouse or manufactory, the constantly changing character of their contents, the depreciation in the value of articles depending on fashions or the caprice of the day, or the removal of articles after Insurance, with the criminal purpose of setting fire to the building insured, with its contents.

Insurance against Hail.—This he considers liable to equal objection, from the impossibility of establishing common rates applicable to the varied products of a country, meadow and corn lands, potatoes, vines, &c., the risk of adjoining fields, the product of which may be so unequal in value, being injured by the same storm; the mode of valuing a partial destruction of crops, the equalization of premiums, since there are some parts of Belgium which are scarcely ever touched by hail, and other parts where its ravages are frequent and severe. He doubts whether the proposition made by the commission recently appointed to examine a similar question in France, viz., to charge a premium of 35 cents. on the capital represented by the property tax, with an indemnity of four-fifths of the estimated value of the damage, and a reservation that where in the case of one and the same individual, the losses do not amount to 10 per cent., or do not equal 10 fr., no indemnity should be granted, would be accepted by the agriculturists of Belgium.

Insurance of Cattle.—The minister concludes against the practicability of such insurance by the State on the ground of similar difficulties as were likely to affect the last two subjects. The varying value, the nicety of calculation required to fix the sum which ought to be paid, when, in some cases, the loss might be caused by the carelessness of the proprietor, and in other cases might occur by epidemics, in spite of the utmost vigilance and skill,—the difficulty of proving what was the cause of death, and lastly, the uncertain manner in which epidemics spread, one district being exposed to severe losses, whilst another is entirely free, are stated as some of the arguments which might be fairly urged against the project. In the French scheme to which he had before alluded,—the premium proposed was 1½ per cent.* of the estimated saleable value, and it is questioned whether the benefit proposed is sufficient to compensate for so great a sacrifice.

Fire Insurance.—The Minister does not perceive the same obstacles in this part of the subject as in the others above named, and he accordingly enters upon the general enquiry how far it would be profitable for the State to undertake this branch of Insurance. In the course of his remarks he endeavours to form an estimate of the insurable property in houses and furniture in Belgium, by different modes of valuation, of which it may be desirable to preserve the principal facts and conclusions.

After pointing out the distinction between the assurable value, the saleable value, and the tenant's value, or registered income, he approximates to the total value, thus—

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* In the Report of the Agriculturist Cattle Insurance Company for 1849, Mr. Riley the able Actuary who had been consulted, stated that from the average of the business for 4 months, July to October inclusive, which had been placed in his hands, he had formed the conclusion that the losses would be about 1¾ per cent. on the risks, or 50 per cent. on the premiums, and that from the accounts for six months longer, the average of the ten months had been found to be about 1½ per cent.

The net registered income from property in houses on the 31st December, 1847, was £1,918,227, viz.:

Income from houses—Town	£892,000
" Country	£804,000
Income from Manufactories—Town	£120,000
" Country	£102,227
Total........	£1,918,227

Adding to this net revenue, the amount abated according to law, we shall obtain a gross revenue of—

In Town	£1,369,320
In Country	£1,225,320
Total......	£2,594,640

Men well qualified to give a fair judgment consider, that on an average, for the 86 towns of the kingdom, the gross registered income, or the tenant value, represents 7 per cent. of the insurable value, and for the rural communes, the average would be 3 per cent. Assuming this per centage for the above income, and making allowance for unregistered house property in the rural communes, which is computed at about half the amount of that on the Government books, and entering into various other corrections, which give the total of the unregistered property as £26,520,000, the Minister concludes that the total assurable value of buildings in Belgium may be set down at about £86,920,000. In order to confirm this result, the Minister has adopted another mode of valuation. Assuming one house, the details of which are known, to be worth for insurance the cost of construction, say £1000, bringing in a gross registered income of £48, and net £36. Such a property would pay £3 12s. for the Government tax (being 10 per cent. on the net income). The total receipts for the tax on all the buildings of the kingdom are about £200,000, and admitting that the same proportion might be assumed for all the proceeds of the tax, the assurable value of registered property in buildings would, in round numbers, be about £56,000,000, to which, adding the £26,520,000, arrived at in the valuation, the total will represent £82,520,000, or about £4,400,000 less than by the preceding mode of ascertaining the results.

The third mode which he has adopted to form a comparison with these two former statements was by taking the average of 200 buildings of different values, and in various parts of the kingdom, which had been submitted to examination, the total of which produced a net income of £3,955, and represented an insurable value of £102,454. The same proportion being applied to the net income of the whole registered property, which he has before shown = £1,918,227, would quote the value of the whole registered property rather more than £50,800,000, to which, adding the same amount unregistered as before ascertained, the total would be about £77,320,000.

Still, a fourth mode of checking the average of these results presents itself by comparing them with those in the state of the Grand Duchy of Baden, where the insurance of buildings is obligatory on the inhabitants, and has for nearly half a century been carried on under the authority and support of the Government. The population of that State is about 1,335,000 inhabitants. The value of property in buildings assured is about £27,813,000, or an average of £20 17s. to each inhabitant. Applying the same average to the 4,337,196 inhabitants of Belgium, the result would give an insurable property in buildings of rather more than £90,000,000.

The minister therefore considers himself justified, from all these methods, in fixing the insurable property in buildings in Belgium at about £84,000,000, the mean of the different results obtained by the preceding various plans.

Furniture.—The law respecting the tax on personal property allows of a much nearer approach to correctness being obtained in this matter than in the other. Objects of art are not comprised in the taxation for personal property; but neither are they included in the risks of Insurance Companies, and therefore may very properly be omitted in a valuation made for the purposes of Insurance. The estimated value of personal property liable to the tax in 1847, was about £5,660,000, which the minister admits must be greatly under the truth. But doubling this amount, and allowing that the furniture in houses which may be too small to come under the inspection of the surveyors, and in public edifices not belonging to the State, and industrial establishments, will produce—

Total Furniture	£13,600,000
Total Buildings	84,000,000
Total insurable against fire	£97,600,000

The average of the premiums paid both in France and Belgium is 85 cents. per 1000 francs, or 1s. 9d. per cent., and it was admitted even by the former commission, that the premium to be charged by the Government should not exceed that for which private Companies could afford to undertake the risks. The commission, however, had assumed 1 per 1000 (2s. per cent.), and upon this supposition, the premium on the above total value would be £97,600.

The next question that arises is, what would be the total of losses and what would be the costs of carrying on the business?

From the enquiries made through the proper Government Departments, the mean annual value of property destroyed by fire in 1839, 1840, and 1841, was £76,220; and from 1844 to 1848 inclusive, £94,416 (the returns for the years 1843 and 1844 being deficient), or the average of the whole period = £85,318. Assuming that some of the risks may consist of other kinds of property, and also that some of the values may be a little exaggerated, it seems fair to conclude that the mean of the losses in the kingdom, and which it is proposed the Government shall insure, may be about £80,000.

As regards the expenses of the necessary establishment, the minister considers that in the first year it will be absolutely requisite to have a valuation made of the entire house property of the kingdom, and that this charge for the 800,000 inhabited and uninhabited houses in Belgium, could not be estimated at less than 800,000 francs (£32,000). He had likewise ordered an estimate to be framed, upon the most economical scale, for the annual expenses of an establishment to carry on this extensive business, and after the most rigorous enquiry, could not set it down at less than £12,000.

Total expenses for the first year . . .	£44,000
Losses, valued as above, at	80,000
Total	£124,100

Consequently, comparing this total with the estimated premium, the first year would show a loss of £26,400; and the subsequent years, a surplus of £5,600. This result is on the supposition of an annual premium of 1 per 1000. But if the average of the premiums charged by private Companies, as before stated, be only taken, the *loss* in the first year would be £41,040, and in each subsequent year £9,040.

A very interesting enquiry is then made into the management of these Insurance institutions by the other Governments of Europe, and it is universally the case, that in Germany, without professing to make a profit from the people, the premiums required to be paid by the Governments are much higher than those charged by the Assurance Companies of either France or Belgium, where they are carried on for speculation, and where the entire object is profit. Thus—

In Bavaria the average premium is	1·87	per 1000	3s. 9d.	per cent.
Saxony	1·79	,,	3s. 1d.	,,
Wurtemberg	1·23	,,	2s. 6d.	,,
Grand Duchy of Baden	1·38	,,	2s. 9d.	,,
Prussia	2·83	,,	5s. 8d.	,,
Switzerland	2·50	,,	5s. 0d.	,,

Such are the charges made where the Governments insure buildings only, the least hazardous of the risks; and profess to derive no advantage from the system, but merely to charge their subjects the lowest cost at which they can be guaranteed from the risks. In France and Belgium, on the other hand, as we have before seen, the average premium is but 1s. 9d. per cent., which includes the full profit of the Companies, and provides for the more doubtful risks of furniture and merchandize.

Finding it so difficult for the State to guarantee these risks on the same terms as the private Companies, the Minister deems it necessary to reply to the objections, which may very naturally be made to his conclusion in the query, how it happens that the Companies are enabled to make so large profits, and the Government, with all its power of concentration and means of organizing an establishment on a great scale should be unable even to undertake the risks without loss at the same premium? His conclusions are, unfortunately, against the credit and fair dealing of the Companies. He throws out something more than inuendoes, that the Companies more readily accept assurances than pay losses; that they make but little enquiry into the values at the time of making the insurance, but are strict enough when the period of payment arrives; that rather than incur the vexations and delays of litigation, the unfortunate assured readily enters into a compromise, and agrees to a large deduction from the amount of his claim; and, lastly, that the Companies accept only the good, and refuse the bad risks.

Without admitting the justice of all these charges of the Minister against the Companies, of which no proof is adduced by him, the force of his remark must be acknowledged, that the Government would not have the same power of either refusing payment in doubtful cases, or of selecting only the best class of risks. It is almost certain, that the public, without going much into detail, would charge with bad faith a Government which even availed itself of the same justice which is accessible to all its subjects, and that having the monopoly in its hands, and compelling every one to assure, it would never be at liberty to tax one portion of the people and exclude them from the benefits which are open to others. To what extent this admission of all classes of risks would increase the average of the premiums, is an important question, to which, perhaps, an answer might be found by analyzing the returns which are in the possession of those States in which similar institutions have been carried on by the Governments.

In order to prove the small profit which is really made from Insurance itself by the Companies, independent of the other sources of profit to which he has alluded, the Minister gives some details of the Assurance Companies of Belgium.

The number of Proprietary Assurance Companies in Belgium, authorised since 1830, is 12, of which 8 only were carrying on business at the date of this Report. According to the returns for 1848, furnished to Government by 7 of the principal of these Companies, the total risks insured by them amounted to £57,128,424.

The premiums received on the above sum		= £49,278	(average ·85 per 1000.)
Losses in the year 1848	£26,881		
Expenses, Commission, &c.	17,028	43,909	
Net profit of 7 Companies		5,369	(nearly 11 per cent. on the premiums.)

The total profit divided amongst these Companies was £13,090, the difference arising from the advantageous investment of their disposeable funds.

Taking the balance of each Company separately, three only were found to have produced a surplus; in the other four, the losses and expenses exceeded the amount of premiums received.

Without proceeding further into the general arguments which the Minister employs to show the inutility or the risk of Government Assurance, we may conclude with the general summary of his decision.

He is compelled to believe that the hope of finding in them a source of profit or revenue of any consequence to the State, is a delusion which ought to be given up, and that both in a moral and political point of view the inconveniences and dangers resulting from the system are greater than the good it can be expected to produce.

Project of Law—Deferred Government Annuities.—This measure, which has been recently proposed by the Minister of the Interior and the Minister of Finance, and sanctioned by the King of the Belgians, contains many articles of very great importance to the labouring population of the Kingdom, and, there can be little doubt, will tend, as in this country, to give all classes an interest in the continuance of order, and the tranquillity of the country. The leading features of the measure are contained in the following Articles :—

Art. 1. A general Institution for the Assurance of Life shall be established, with the guarantee of the State, and under the authority of Government,—to begin operations from the passing of the present law, by granting Deferred Annuities.

Art. 2. Any person, not under 18 years of age, may, by a single payment, purchase a Deferred Annuity, to commence at not less than 10 years from the date of purchase.

Art. 3. A married woman, in order to purchase a Deferred Annuity, must deposit the authority of her husband. In case of the husband's refusal, the Magistrate, after hearing or summoning the parties, or in case of the absence of the husband, may give an authority to the wife. The authority is valid, until its revocation is notified to the Government agent, and all annuities acquired in the meantime belong exclusively to the wife.

Art. 4. The rates are given in a subjoined Table, calculated from the actual mortality, at 5 per cent. interest.

Art. 5. The minimum Annuity is fixed at 24fr. (say £1); the maximum Annuity that can be enjoyed is 1,200 fr. (say £50). The purchase-money subscribed for all Annuities beyond the latter sum, will be forfeited to the State.

Art. 6. Any sum of 5 fr. and upwards, will be received. All sums which are too small for the purchase of a single Annuity, will remain without interest, till subsequent payments permit one to be obtained.

Art. 7. The purchase of the Annuity may be made at the option of the assured, to commence at 55, 60, or 65 years of age. The same party may purchase Annuities beginning at different ages, but on every purchase the period of entering into possession must, necessarily, be fixed.

Art. 8. Every person, depending entirely on his labour for subsistence, and who, previous to the period at which his Deferred Annuity commences, becomes, by the loss of a limb, or an accidental and permanent infirmity, not contracted in the military service, disabled and incapable of providing for himself, shall immediately begin to receive payment of the Annuity he has purchased, provided five years have elapsed, and that the Annuity do not exceed 360 fr. (say £15).

Art. 9. The payments are considered irrevocable, excepting those which a married woman has made, or those which, according to Art. 6, have not become convertible into Annuities. The former may be returned, but without accumulation of interest, to whomsoever has the right to them; but the latter only to the depositors, and in case only of their having arrived at the age beyond which Annuities are not granted.

Art. 10. The families of the assured will have no claim on the fund; but in all cases of extreme poverty, the funeral expenses of those who die, after becoming entitled to the Annuity, will be paid from the fund.

Art. 11. The Annuities are not liable to cease, or to be forfeited, except in certain cases, where they exceed £15.

Art. 12. Every person is permitted to make the payments in the name and for the benefit of a third party; but the Annuities will only be paid to the parties for whose benefit they are subscribed.

Art. 13. The Annuities are paid in monthly instalments by the

Government agents, in the various places where the annuitants reside, and only to those who are residing in the Kingdom.

Art. 14. Every person assured will receive a little book, containing the payments he has made, and the annuities and arrears to which he is entitled.

Art. 15. Royal decrees will determine the form and entries of the book, as well as the mode of proving the age, the residence, and the existence of the assured.

Art. 16. The Fund is to be under the management and direction of a Commission of five members, named by the King.

Art. 17. All receipts shall be paid direct into the Treasury, and an account of the receipts and expenses remitted monthly to the commission.

Art. 18. All available receipts are to be applied by the Minister of Finance in the purchase of the Government Funds, in the name of the Fund.

Art. 19. The accounts of the Fund are to be made up to the 31st of December in every year. The Commission publishes and submits to the control of nine commissioners, selected from the Provincial Councils, a Report and Financial Statement of the Fund.

Art. 20. Each Provincial Council selects, during the ordinary session, one of their members, to examine and verify the accounts of the following year, before the expiration of the first quarter from the close of the year.

Art. 21. All acts and legal documents necessary for carrying into effect the provisions of the present law, are delivered gratis, and free of stamp and registration duty.

Art. 22. During the first five years after the promulgation of this law, the Annuities may be granted, commencing only five years after the date of purchase.

Signed at Brussels, 29th June, 1849, by the King Leopold; and countersigned by the Minister of the Interior, Ch. Rogier, and by the Minister of Finance, Frère-Orban.

GERMANY.—*Gotha.—Life Assurance Company for Germany.*

The 20th Report of this important Company, the business of which has been continually increasing under the management of Herr G. Hopf, until it has now become the greatest institution of the kind in Germany, contains a complete history of the Company from its foundation to the end of 1848, presented to the member in two tabular forms. They exhibit the progress and condition of the Company for each of the ten years from the commencement, and of the ten last years to 1848, inclusive. If space permitted, it would prove a matter of great interest to reprint the whole of these two sheets; but a comparison of the summary of the different items for the ten years 1829 to 1838, and 1839 to 1848, both inclusive, with a few explanatory notes, must suffice to afford a notion of the complete information respecting the state of their affairs, which is accorded to the proprietors and the assured. We may take occasion in a future number to recur to the excellent reports of this Company, merely expressing a hope that they may prove a model for imitation by some of the older societies in this country, whose history, if publicly recorded in a similar manner, would afford the most valuable aid in illustrating the progress of Life Assurance in Great Britain.

Summary of the Operations of the Life Assurance Company for Germany, in the Decennial Periods, 1829 to 1838, and 1839 to 1848.

	Average for One Year.				Total from	
	1829 to 1838.		1839 to 1848.		1829 to 1848.	
	Persons.	Amount.	Persons.	Amount.	Persons.	Amount.
I. Assurances.		£		£		£
1. Proposed	1,391	307,673	1,442	291,934	28,330	5,995,971
2. New Assurances effected	1,065	262,674	1,040	238,457	21,052	5,011,314
3. Assured in the course of the year.	5,154	1,286,700	12,876	2,966,169	180,305	42,528,686
4. Of which, for Terms of Years..	217	70,348	238	66,644	4,552	1,369,871
5. Average Sum on one Life	......	254	......	230	......	4,841
6. Average Age of the Assured ..	(Age 43)	....	(Age 46)			
7. Decrease of Assurances:—						
a. Voluntary, by discontinuance of Policies, or expiry of short Assurances.	121	38,149	207	54,784	3,278	929,332
b. By Death	66	16,504	208	48,677	2,738	651,811
Average of each claim ..	......	250	......	237	......	4,869
c. Total Decrease	187	54,653	415	103,461	6,016	1,581,143
8. Actual Mortality — Ratio per cent. to the Assurances.	1·18	1·17	1·58	1·62	27·66	27·85
9. Expected Mortality	70·73	17,825	218·43	51,617	2891·55	694,424
Do. Average for each Claim..	......	258	......	237	......	4,949
10. Deviation of the actual Mortality from that anticipated:—						
a. Above the Expectation ..	1·28	474	4·82	595	60·54	1,068
b. Under the Expectation ..	6·06	1,795	15·35	3,534	214·09	5,329
11. Net Increase in the course of the year.	878	208,021	626	134,995	15,036	3,430,171
12. Existing at the end of 1838 and 1848.	8,779	2,080,210	15,036	3,430,171		
II. Receipts.						
1. Premiums	......	45,486	......	104,182	......	1,503,475
2. Entrance Money	......	2,267				
3. Interest on Loans	......	4,176	......	18,425	......	296,013
Average rate per cent.	......	3·94	... ..	3·71	......	76·48
4. Extraordinary Receipts	......	162	......	654	......	8164
5. Total Receipts	......	50,504	......	123,261	......	1,737,652
III. Expenditure.						
1. Claims from Deaths	......	15,792	......	47,618	.....	684,169
2. Assurances fallen due in Lifetime.	......	....	......	....	......	1,186
3. Returned Entrance Money	.... .	697	......	....	......	6,973
4. Dividends to the Assured	......	6,210	......	17,992	......	210,967
5. Surrendered Policies, &c.	......	278	......	959	......	11,533
6. Expenses of Management:—						
a. Commission to Agents	......	1,177	......	2,318	......	34,952
b. Other charges	......	2,041	......	3,661	......	57,023
c. Percentage of Expenses to Total Receipts.	......	6·7	......	4·91	......	116·12
7. Extraordinary Expenses	......	53	......	309	......	3,614
8. Total Expenditure	......	23,060	......	72,977	......	960,368
IV. Clear Surplus for Division amongst the Assured.	......	8,835	......	25,457	......	342,921
Of which, after five years' retention in the Guarantee Fund, was disposed of as Dividends:	....	6,659	......	17,817	......	211,462
Being a per-centage of	......	24·	......	23·	......	350
V. Total Liabilities at the end of 1838 and 1848, consisting of,	... ..	274,439	......	777,276		
1. Outstanding claims	......	9,892	......	21,747		
2. Premiums paid in advance	......	20,185	......	38,298		
3. Value of existing Policies	......	189,373	......	585,773		
4. Guarantee Fund	......	54,989	......	131,459		
VI. Securities at the end of 1838 and 1848.						
1. Cash in hand	......	2,724	......	2,612		
2. Mortgages	......	259,148	......	732,991		
3. Advances on Policies	......	1,311	......	19,470		
4. Interest due	......	2,330	......	9,169		
5. Balances due by Agents	......	8,414	......	12,618		
6. Value of the Company's freehold	......	....	......	299		
7. Due to the Company	......	511	......	118		

The two last columns contain the sum of the numbers, whether of individuals or amounts, for the last 20 years; and in those cases in which an average is required, must accordingly be divided by 20, thus:—No. 3, under the head of Assurances, 180,305, implies that the total number of persons who have been assured from the commencement is equal to that number assured for a single year, or that there have been on the average 9,015 persons assured in the course of each of the twenty years; and the £42,528,686, represents an average of £2,126,434 sums assured in each year. So also No. 5, £4,841, under the same head, implies the sum of the average sums assured on one life in each year, or that the average in the whole 20 years was £242 on each life.

The deviations of the actual mortality above that which was anticipated, being very small in amount, form an item which requires explanation. They occurred in the first decennial period only in the years 1832, 1836, and 1837, and in the second decennial period, only in 1847 and 1848. In all the other years, the deaths being fewer than were to be expected, show a result at the end of each ten years considerably to the advantage of the Society. Thus, in the first decennial period in which 707 deaths were reckoned upon, there occurred in different years 12·8 above, and in other years 60·6 below the estimated number, or a difference of nearly 6·8 per cent. per annum on an average in favour of the society. In the second decennial period, in which 2184 deaths were to be reckoned upon out of the number living, there occurred 48·2 above and 153·5 under the expected number, or rather more than 4·8 per cent. in favour of the Society. In both cases, the estimated and the actual mortality approximate so closely, in consequence of the former having been computed from the experience of previous societies. The careful improvement of the funds deserves notice, the rate of interest obtained on loans having been increasing every year for the last six years, and in the last year averaging 4 per cent. The guarantee fund in like manner has been steadily improved, and in 1848 exceeded £131,000.

The youngest average of the ages of parties assured was in 1831, soon after the establishment of the Company, when it was under 42 years of age; and the average age gradually increased till in 1848 it was 47 years 4 months.

The greatest number of proposals was in 1847, when they amounted to the large number of 1706. Of this number 1235 were accepted and completed, assuring the sum of £278,300, whilst in the following year, 1848, the proposals decreased to 1151, and the number actually completed to 824, being the smallest number since the year 1830, whilst the mortality in that fatal year was proportionately greater, 325 claims by deaths having occurred when only 290 were expected.

Gotha.—Twenty-ninth Balance Sheet of the Fire Insurance Company for Germany, for the year 1849.—From the following Balance Sheet of the Fire Insurance Company for Germany, for the year 1849, its members will perceive that the Total of the existing Insurances of the past year has amounted to 343,611,898 Thalers (£49,087,400). This was 3,604,610 Thalers (£514,944) higher than the sum insured in the year 1848. The slowly improving condition of the times, and the circumstances of the country, demanded the most constant and active circumspection in the acceptance of new proposals for Insurance, and vigilant caution in the extension of the business of the company. It was to be regretted that prudence occasionally required even the restriction of its operations. The net receipt of premiums for the year 1849, amounted to 1,122,282 Thalers (£160,326); it exceeded that of the preceding year by 11,994 Thalers (£1,713). The experience of the Company having proved to its disadvantage, required that in various places, as well as for some classes of risks, higher premiums should be demanded. For the numerous losses by fire, of which an accurate specification, contained in schedule B, subjoined to this Balance Sheet, is deposited with every agent for the inspection of the members of the Company, 427,458 Thalers (£61,065) were actually disbursed, and 149,539 Thalers (£21,363) in addition, has been set aside to provide for claims still unsettled. The latter sum includes some disputed claims of former years, and of 1849. It likewise includes a reserve for the possible loss which might arise from the difference of the course of exchange in a realisation of the Credit-Association and Country Paper belonging to the Company, which may be necessary. The total sum paid and reserved in the year 1849, for losses by fire, damages and expenses, amounts to 635,695 Thalers (£90,812); and is 39,634 Thalers (£5,662) less than the similar item in the account for 1848. From these statements it is ascertained that the dividend which the Company is in a position to return to its members, as the profits for the year 1849, amounts to 54 per cent.

The expenses of management of the Company, which are detailed under their respective heads in the schedule C, appended to the Balance Sheet, and which may be inspected at the different agents, amounted to 34,972 Thalers (£4,996). They are covered by the interest obtained on money advanced. By the regulations of the Company, the portions of dividend remaining unclaimed, from the year 1843, have been added to the receipts for the year, and increased them by 1,095 Thalers (£156). Those members of the Company who have not yet claimed their proportion of dividend for the year 1844, are hereby again reminded to receive it, since with the close of the current year, it will in like manner be forfeited by the clauses of limitation. If the results of the Company's financial year, which has just expired, be considered satisfactory, much more is there cause for congratulation when we look back to the unanimity with which, even during the uncertain political position of our Fatherland, the inhabitants of almost all the German States cordially and readily extended their helping hand to each other, on being called upon to afford physical assistance in disasters arising from the misfortune of fire.

	RECEIPTS.	£	£
1.	The Premiums carried over from the year 1848, amounted, according to the 28th Balance Sheet, to	77,947	
	From which deduct for Premiums returned or altered Insurances, as per Schedule A.	247	77,700

			£	£
2.	For losses, damages, and expenses which remained unsettled, and were written off as Reserve, per 28th Balance Sheet		....	16,634
3.	The entire receipt of Premium in the year 1849, after deducting commission to agents, amounts, as per Schedule A, to		....	160,326
4.	The Interest due in this year (no arrears of which exist), amounts to		....	5,279
5.	From profit on the course of exchange, a receipt arises of		....	77
6.	For lapsed Dividends of the year 1843		....	156
	The aggregate Net Receipts in the year 1849 amounted therefore to		....	260,172
	EXPENDITURE.			
1.	For losses by fire, salvage-outlay, and costs of of repairing, &c. :—			
	(a) Arising from the year 1848 and previous years, including £25 loss by the insolvency of an agent, as per Schedule Ba .		2,203	
	For payment of Dividends of 1848		1,186	
	(b) Of the year 1849 as per Schedule Bb ..		61,065	
2.	For current expenses, as per Schedule C		4,996	
	RESERVE.			
1.	For outstanding losses, damages, expenses, &c., and others not yet reinstated of 1849 and previous years, as also for commission and portions of the dividend	£21,363		
2.	To cover the risk of Insurances, extending into future years	77,519		
			98,882	
				168,332
	Leaving a clear Surplus of....................		....	91,840
	Which upon £170,077 (the sum participating in the profits of this year as per Schedule A), gives a Dividend of 54 per cent.			
	The aggregate sum of the Insurance Contracts in force in the year 1849, reached		....	49,087,400
	That of Insurances paid in advance for future years		....	967,112
	Of which, for 1849		676,763	
	,, for 1850		290,349	

The specific schedules, A, B, C, of this account, are deposited with the agents of the company for the inspection of the members.

Gotha, 15th March, 1850.

Becker, Director.	J. Nagel, Manager.	F. Arnoldi, Cashier.	C. A. Scheibner, Bookkeeper.

It is hereby witnessed, that the items specified in this 29th Balance Sheet for 1849, viz. :—

£77,519	Premium carried over for the year 1850 to 1856.
21,363	Reserved for the settlement of all reported losses, expenses and damages for 1849, &c., and for others not yet entirely reinstated.
91,840	Surplus of the year 1849.

190,722	But exclusive of,—
	£2,431 for unclaimed dividends of former Balance Sheets.
	224 for returns of premium not yet paid.
2,655	———
193,377	in total amount, are in disposable securities, viz.:—
144,036	Monies advanced at interest on good security, and with the approval of the directors.
30,012	Credits in the hands of the agents and bankers.
16,325	Cash in hand and bills running.
2,829	For the Company's premises.
175	For the Company's furniture.
193,377	Being in amount, as above, in addition to which there is,
714	Security from the manager.
2,857	Security from the Cashier.

All have been examined in the present audit, and are detailed in the mortgage deeds belonging to the Company; they are found to be correct, and the accounts of expenses have been compared with the proper vouchers.

After a subsequent careful revisal of the items and castings of the bank books, and of the balance sheets, this Account is passed by us as correct.

Gotha, 4th April, 1850.

The Committee of Audit:
Chr. Heinr. Wellendorf, of Arnstadt.
F. A. Morgenroth, of Erfurt.
C. G. W. Trebsdorf, Special-Auditor.

We acknowledge the preceding 29th Balance Sheet of the Fire Insurance Company for Germany as correct, proved by the audit which it has passed. It will be forwarded to every member of the Company. At the present meeting of Governors, Hr. Hofrath Becker has been re-elected, as Director of the Bank for one year, from the 1st July, 1850, to the same date of 1851, and Hr. Adolph Matthäi as his representative.

Gotha, 18th April, 1850.

The Governors of the Fire Insurance Company for Germany.
Werneburg, Chairman.
Heinr. Lucas, Representative of the Governor at Arnstadt.
Wilh. Hoffman, Governor at Erfurt.
Georg. Zichner, Governor at Gotha.

BERLIN.—*Fire Engine Establishment.*

The improvement of the Fire Engine Establishment is occupying the attention of the city authorities and the police; in its present form it is very defective; but, were it more complete, the insufficient water supply of Berlin would still prove an insurmountable obstacle to any decided improvement. The open tubs of water that stand about the city at certain points, ready to be dragged if wanted to the spot, are miserable substitutes for mains and pipes; and as they are not emptied or changed for months together they become green and stagnant, and seem intended to increase the variety of villanous smells that put Berlin, though so much better built, on a bad equality with Cologne. A fire near the river may be got under if the engines arrive within an hour or two of its breaking out, which is not to be depended on, as a case lately occurred when they appeared just three hours after all the danger was over; and any fire within the power of a few buckets from the next pump to subdue it may also be conquered; but for most fires little can be done save to let them burn out and trust to the stout party walls to prevent them spreading. As long as the city is so ill supplied with water the evil is beyond any organization of the engine department to remedy completely. But an alteration is proposed in the manner of giving the alarm that will be very desirable. The present practice is that of the middle ages, and might do for a village, but in a great capital is ridiculous. The old watchmen, who are joint guardians of the night with the new police—the new and the old existing side by side—are provided with horns, and if one of them blows the hideous note of alarm, it is taken up by one after the other over the whole city, no matter how distant the point of danger. If the sleeping inhabitants of Sloane-street were all roused because there was a house on fire in Whitechapel, it would be the parallel case in London. Even this, if it answered any purpose, might be tolerated, but the crowning absurdity of the thing is, all the noise in every quarter gives no guide to where help is required. If you stop one of the ancient officials while blowing his hardest, pouring all the breath that *schnaps*, long vigils, and 50 years' service have left him, through his horn, and ask, naturally enough where the fire is, a stolid "*wees'-nit*" is the invariable answer, and that given in a half angry tone, as if he were disturbed by your being "so superfluous" as to put a question on a matter so perfectly indifferent to him; it is his business to blow when he hears others blow, and the whole city having been alarmed, nobody informed and nothing expedited, the objects of the police regulation are accomplished. But it is now discovered that this mode of giving warning of a fire is "unpractical," and several others are proposed; they may all easily be better, and fortunately none can be worse than the present one.—*Correspondent of the Times*, 19*th June*, 1850.

East and West Indies.—Return to an order of the House of Commons, dated 8th March, 1850, for a Return of the Mortality from disease among the European Troops in Her Majesty's Service in the East and West Indies, respectively: showing the number of deaths per cent. on the whole force employed in each year, from 1840 to 1848, both inclusive.

Years.	EAST INDIES.			WEST INDIES.		
	Strength.	Deaths from Disease.	Ratio per cent on Strength.	Strength.	Deaths from Disease.	Ratio per cent on Strength.
1840	19,551	1,441	7·37	5,783	389	6·72
1841	21,635	1,477	6·82	5,870	530	9·86
1842	26,342	2,588	9·83	5,301	238	4·48
1843	28,047	2,154	7·67	5,246	286	5·47
1844	26,345	1,480	5·61	4,266	217	5·08
1845	26,392	2,205	8·35	4,513	216	4·78
1846	25,195	1,899	7·53	4,733	144	3·04
1847	25,356	1,165	4·59	3,550	106	2·98
1848	23,444	930	3·96	3,981	230	5·77
Mean	24,701	1,704	6.86	4,749	262	5·35

Deaths which occurred in Hospitals in consequence of wounds are not included in the above Return; of such during the 9 years (from 1840 to 1848 inclusive) there were 370 in Bengal, 39 in Bombay, 2 in Madras, and 4 in the West Indies.

The highest mortality in the East Indies was in 1842, 9.82 per cent., and the lowest in 1848, 3.96 per cent. In the West Indies the highest rate was, in 1841, 9.86 per cent., and the lowest, in 1847, 2.98 per cent. It is gratifying to notice that, in both climates, the last five years of the period, compared with the first five years, exhibit a decided diminution in the mortality observed. In the East Indies the average mortality, from 1840 to 1844 inclusive, was 7.46 per cent.; and from 1844 to 1849 inclusive, 6.01 per cent. In the West Indies, also, the average mortality in the same period was respectively 6.32 and 4.33 per cent., confirming not only the observations of Col. Tulloch, as to the improvement lately observed in the West Indies, but even pointing out how the general notions which prevail as to the relative salubrity of the two climates, may be reversed by the selection of suitable stations and other sanitary measures, quite within the controul of the authorities.

BOMBAY.—(From the *Bombay Times*), *Mortality amongst Europeans in the Bombay Army for* 8 *years from* 1841 *to* 1848 *inclusive.*—"Subjoined is a Table of very great interest of the amount of casualties and nature of the diseases causing death in the Bombay army for the last 8 years. The difference of salubrity in different districts, as well as in different years, is remarkable. The deaths which, during the past 8 years, averaged close upon 6 per cent. throughout the Presidency, amounted, in 1848, the healthiest year, to little more than 2½ per cent., while in 1842 it was close on 9 per cent., and in 1844 exceeded 7¼ per cent. Again, taking difference of space instead of time, we find the same surprising diversities. At Kirkee, which seems the most healthy station in the Presidency, the mortality has been under 3 per cent.; while at Deesa, Belgaum, and Poona, it has been under 3¾ per cent. The recent salubrity of Scinde has made up for its former unhealthiness, and though, on the 8 years it gives us the high average of 12 per cent., it falls short of the Presidency, where it is close on 12½ per cent. In Scinde during the years 1844, 1845, and 1846, the mortality was no less than 18, 19, and 16 per cent.; in 1847 it sunk at once to 1·94, and in 1848 is no more than 2·54 per cent. On an examination of the returns for Bombay, we find a per centage of 19 for the year 1842, when malignant fever got amongst European troops, and H.M.'s 17th suffered so fearfully. The following year H.M.'s 86th and 28th suffered from cholera, and the mortality is 18 per cent.; we forget what special sickness prevailed in 1844, but the mortality for this year continues as high as 15 per cent. The two past years seem every where distinguished for their salubrity, and our averages sunk accordingly to 6 and 5½ per cent."

"The lowest average we find anywhere is that of Mhow, for 1844, where we have only 1·06 per cent. of mortality; next to this is Kirkee, for 1843 and 1847, where we have 1·62, and 1·26 per cent. respectively. During 1847 and 1848, Belgaum goes down to 1·47 and 1·36; and Ahmednugger to 1·59, and 1·80 per cent. respectively. To make the table complete nearly all we want is a set of copious annotations, in reference to the state of the climate for the various years examined, and of the particular circumstances in the management or the accommodation of the troops, which seem to bear on their health and longevity. Under the first head we want to know the pressure, the heat, the fall of rain, and the humidity of the atmosphere, &c. The other matter might, even for the past, now be cleared up, and were the attention of the officers at the various localities enumerated in the returns to be collected on the subject, they might be able to say what was the effect, as at Poona, of the system introduced by Sir T. Wilshire of making European soldiers take air and exercise instead of confining them day by day to their barracks; what the consequence of gardens at Ahmednugger, Kurrachee, and Belgaum; of soldiers' libraries, or reading rooms, where these had been brought into existence; of the use of malt liquor in the place of ardent spirits, or the substitution for either of these of beverages which "cheer but not inebriate." Enquiries such as these meet the desires of the most rigid utilitarian; they do not only give us facts for reflection, theory, or speculation, which may or may not be of benefit—they provide for us the foundations on which a sound sanitary system for our troops might be based, affording facts and principles which might at once be reduced to practice."

In presenting to the readers of the *Assurance Magazine* the summary of the facts recorded, our object is to show the comparison of the sanitary condition of the different districts and the classes of diseases which have most prevailed on an average. It is considered, that as the same general system may be presumed to be established, the health of the troops being under efficient medical superintendence, and the army composed of men of the same average age and character, the results will fairly show the effects of the climate upon the European constitution under similar circumstances. It has not been deemed necessary to give the actual mortality in each year, nor the actual admissions into hospital at the different stations in each year; but merely the average strength and the proportions of admissions into hospitals and the deaths for each of the 8 years, from which the true numbers may be calculated if necessary.

	Average strength	Annual Ratio of Admission to strength per cent.	Annual Ratio of Deaths to strength per cent.	Average strength	Annual Ratio of Admission to strength per cent.	Annual Ratio of Deaths to strength per cent.	Average strength	Annual Ratio of Admission to strength per cent.	Annual Ratio of Deaths to strength per cent.
	1841.			1842.			1843.		
Poonah	2,025	298·17	4·44	2,127	295 95	6·39	2,023	279·73	3·55
Kirkee	701	195·	2·28	635	159·05	6·29	678	128·90	1·62
Deesa	895	200·78	2·23	1,067	222·11	2·71	1,091	161·68	2·84
Belgaum	560	260·17	5 85	643	191·91	5·28	1,023	178·10	3·71
Mhow	......	......	......	107	326·16	12·14	103	229·12	5·82
Ahmednugger	539	308·50	4·34	403	257·81	4·71	610	224·68	3·28
Bombay	996	357·12	13·85	826	342·13	19·00	721	381·83	18·16
*Scinde	1,737	440·81	13·06	3,340	234·49	14·73	2,606	136·45	10·78

* The average strength in Scinde for 1841, 1842, and 1843, includes H.M.'s troops only.

	Average strength	Annual Ratio of Admission to strength per cent.	Annual Ratio of Deaths to strength per cent.	Average strength	Annual Ratio of Admission to strength per cent.	Annual Ratio of Deaths to strength per cent.	Average strength	Annual Ratio of Admission to strength per cent.	Annual Ratio of Deaths to strength per cent.
	1844.			1845.			1846.		
Poonah	2,036	273·79	2·96	2,258	250·22	5·68	1,935	268·83	3·77
Kirkee	635	181·25	2·04	631	165·92	4·75	639	335·86	2·81
Deesa	941	193·19	2·97	941	186·07	2·86	1,233	156·52	3·56
Belgaum	758	348·54	3·69	870	245·74	4·36	825	208·72	4·48
Mhow	94	221·27	1·06	97	170·10	5·15	......	......	......
Ahmednugger	696	239·77	9·42	521	208·63	2·11	224	211·07	2·23
Aden...... .	......	......	......	......	......	......	236	180·08	6·35
Bombay	575	397·56	16·86	1,116	390·77	12·00	657	334·55	8·06
Scinde	2,138	332·08	18·70	1,494	201·53	19.21	3,703	234·40	16·47

	1847.			1848.			Annual Mortality, average for 8 years.	Total Deaths in 8 years.
Poonah	2,368	233.44	2·58	2,257	230·60	2·06	3·89	685
Kirkee	633	249·92	2·84	704	215·34	1·26	2·98	143
Deesa	1,148	149·65	3·74	1,242	162·72	3·46	3·04	264
Belgaum	1,085	194·74	1·47	1,095	157·71	1·36	3·64	236
Mhow	......	......	......	......	......	......	*6·18	23
Ahmednugger	439	226·87	1·59	388	243·80	1·80	3·68	152
Aden........	852	166·54	4·22	582	176·46	2·28	†4·26	64
Bombay	807	215·61	6·44	575	208·69	5·56	12·49	794
Scinde	1,875	148·58	1·94	2,044	149·26	2·54	21·18	2,385
								4,726

Annual Average of Deaths per Cent. throughout the Presidency.

Year.	Average Mortality.	Year.	Average Mortality.
1841	6·43	1845	7·01
1842	8·90	1846	5·96
1843	6·22	1847	3·09
1844	7·26	1848	2·53
Mean.. ...	7·20		4·65

Total Deaths in Eight Years, with Proportions dying by different Diseases.

	Deaths.	Proportion per cent. of strength.
Cholera	1,163	1·69
Diarrhœa and Dysentery	1,461	2·13
Delirium Tremens	69	·10
Fevers	960	1·40
Hepatic Diseases	326	·47
Inflammations	71	·10
Wounds	79	·11
Other diseases	597	·87
‡Total	4,726	6·87
Total strength in Eight Years	68,737	

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* Four years only. † Three years only.

‡ Out of these 4,726 deaths, 2,385 occurred in Scinde, and 1000 of them amongst H.M.'s troops in 1841, 1842, and eight months of 1843.

Census of Bombay.—In the Supplement to the Bombay Government Gazette, published Tuesday, 15th January, 1850, appears the following Notification:—General Department.—The Right Hon. the Governor in Council is pleased to direct the publication of the annexed statement, showing the result of a Census of the population of Bombay and Colaba, taken on the 1st May, 1849, and the Reports of which were received originally on the 25th July, and finally on the 29th September last.

By order of the Right Hon. the Governor in Council,
J. G. LUMSDEN, Secretary to Government.
Bombay Castle, 10th Jan., 1850.

Statement showing the relative numbers of Young, Adult, and Aged Persons of the different persuasions, compiled from the data furnished by Captain Baynes.

Names.	UNDER 14 YEARS.				UNDER 51 YEARS.			
	Males.	Females'	Total.	Proportion of Fem. to 100 Males.	Males.	Females.	Total.	Proportion of Fem. to 100 Males.
Jaen, Lingaet, or Boodhist.	200	248	448	124	797	495	1,292	69
Brahmins and other Castes of Hindoos.	20,173	12,107	32,280	60	153,137	73,999	207,136	48
Mussulmans	11,312	10,727	22,039	84	57,918	28,064	85,982	48
Parsees	13,496	13,437	26,933	99	39,192	32,325	71,517	82
Jews	158	142	300	89	371	304	675	81
Native Christians ..	790	872	1,662	110	3,804	1,620	5,424	42
Indo Europeans	894	802	1,696	89	2,924	1,732	4,656	59
Pure Europeans	289	223	512	77	3,109	1,325	4,434	42
Seedee or Negro Africans.	54	30	84	55	664	91	755	13
Other Castes	859	959	1,818	111	2,853	1,895	4,748	67
	48,225	39,547	87,772	82	264,769	141,850	406,619	53·5

Names.	UNDER 81 YEARS.				Grand Total.	Proportion of Youths to Total	Proportion of Adults to Total	Proportion of Aged to Total.
	Males.	Females.	Total.	Proportion of Fem. to 100 Males.				
Jaen, Lingaet, or Boodhist.	86	76	162	88	1,902	23·5	67·9	8·5
Brahmins and other Castes of Hindoos.	23,669	13,846	37,515	58	296,931	17·8	69·7	12·6
Mussulmans........	8,119	8,005	16,124	98	124,155	17·7	69·4	12·9
Parsees	8,279	7,969	16,248	90	114,698	23·4	62·3	14·1
Jews	83	74	157	89	1,132	26·5	59·6	13·8
Native Christians ..	216	154	370	71	7,456	22·2	72·7	4·9
Indo Europeans	225	173	398	76	6,750	25·1	68·9	5·8
Pure Europeans	97	45	142	46	5,068	10·0	87·1	2·7
Seedee or Negro Africans.	21	29	50	138	889	9·4	84·9	5·6
Other Castes........	291	261	552	89	7,118	25·5	66·7	7·7
	41,086	30,632	71,718	74·5	566,119	15·5	71·8	12·6

COAST OF AFRICA.—Return of the Mortality per cent. amongst the officers and crews of Her Majesty's Ships, employed on the Coast of Africa, in each year from 1840 to 1848, both inclusive.

Years.	Number of Deaths.	Mortality per cent.	Years.	Number of Deaths.	Mortality per cent.
1840	35	4·1	1845	128	5·
1841	85	7·9	1846	98	3·3
1842	72	5·4	1847	81	2·5
1843	27	2·1	1848	63	2·2
1844	49	2·8			
			Mean	80	3·9

MISCELLANEA.

The Diseases of Tradesmen.—A curious work, from which, as it is probably seldom seen, we propose to make occasional extracts, to show the early notions which prevailed before more scientific enquiries were instituted on subjects affecting life and health, was published in 1705, entitled, "A Treatise of the Diseases of Tradesmen, shewing the various influence of particular trades upon the state of health; with the best methods to avoid or correct it, and useful hints proper to be minded, in regulating the cure of all Diseases incident to Tradesmen, written in Latin by Bern. Ramazzini, Professor of Physick at Padua, and now done into English, 1705." The preface itself contains, in the quaint language of the translator, the object and intention of the author.

"In the meantime I hope all candid physicians will excuse my imperfections upon the consideration that all trades are not followed and practised in one city or country, there being divers trades according to the variety of countries that may give rise to diseases. The shops or workhouses of Tradesmen are the only schools in which we can find any satisfactory knowledge of these matters; and out of these places I have endeavoured to pick whatever might best please the taste of the curious, and chiefly indeed to suggest such cautions as may serve to prevent, and cure the diseases to which tradesmen are usually subject. When a physician therefore is called to visit one of the poorer and meaner sort of people, I would advise him not to clap his hand to the pulse as soon as he comes into a room, without inquiring into the circumstance of the patient, nor to stand as 'twere in a transient posture, to prescribe where the Life of Man is concerned; but to sit down by the patient, let the place be never so sorry, and carefully interrogate him upon such things, as both the precepts of our art, and the offices of piety require us to know. The oracle of the Divine Head of our order informs us, that when a physician visits a patient, he ought to inquire into many things by putting questions to the patient, and the bystanders. *When you come to a sick Person*, says Hippocrates, *it behoves you to ask what uneasiness he is under, what was the cause of it, how many days he has been ill, how his belly stands, and what food he eat?* To which I'd presume to add one Interrogation more; namely, *what trade he is of?*"

The Diseases of Metal-diggers:—"Now the diseases that Metal-diggers and other such like artificers are liable to, are for the most part a difficulty of breathing, pthisick, apoplexy, palsy, cachexy, swellings of the feet, falling of the teeth, ulcers in the gums, pains and tremblings in the joynts, so that upon the whole, their lungs and brain are affected; but especially the lungs, which suck in the mineral spirits along with the air, and so receive the first onset; after which the same spirits, admitted within the verge of life and mingled with the blood, corrupt and taint the natural temperament of the brain, and the nervous juice from whence spring the tremblings, stupidity, and other disorders above mentioned. Hence is it that those who dig minerals in the mines are but short liv'd; and the women who marry 'em have the opportunity of matching several husbands; for Agricola is witness, that near the mines of the Carpathian mountains women have been known to marry seven husbands. And Lucretius says of the same persons :—

Nonne vides, audisve perire in tempore parvo
Quam soleant et quam vitai copia desit."

After describing how the early Christians were condemned to the mines as a punishment, and from ancient authors and sculptors, what a wretched existence the miners were then compelled to lead, our author continues, "And even in our time I reckon the Mine-diggers are not much more handsome, for suppose they fed clean, and had good things about 'em, yet such is the influence of the dark and impure place they draw their breath in, that their looks speak the very shades below, even when they peep out into our purer air. In fine, let the mineral they dig be what it will, they are still liable to grievous diseases that oftentimes elude all manner of cure, even when proper things are prescribed; and indeed it seems to be a doubtful case whether we ought to reckon it a good and pious office, to prescribe Physick to such wretches, and thereby prolong a miserable Life."

Interest of Money in 1728.—"At the request of several gentlemen, who were purchasers of my *New Method for Valuing of Annuities upon Lives*, I have been prevailed upon to spend some more of my leisure hours in making the following *Estimate of Places for Life;* and finding upon observations that the purchasers of late have been allowed upwards of 9 per cent. for their money, I have therefore made my calculations at 9, 10, 11, and 12 per cent. Nor can I see why a purchaser should value his money at anything under the fore-mentioned rates, when he is buying of a place, if he considers that he is taking upon him an employ which may require labour and attendance to obtain the annual income such a place may be deemed to be worth: And, indeed, when he has put such a value upon his money, there is but a small variance from the usual allowances by cathedrals and colleges to the purchasers of the leases of their estates for a certain term of years." (The work, in the preface of which this paragraph appears, not being very often met with, and the title being, it is to be hoped, very descriptive of the contents, we quote it at length: "An Estimate of Places for Life, shewing, how many years purchase a Place for Life is worth; how long a Man must hold his Place to have the Value, Principal, and Interest, of the Purchase Money; how much he has coming in per cent. per annum for his Money; what a Place for Life is worth; the Income not exceeding £1000 per annum; all at One View: the whole being calculated upon the Chances of the Probabilities of Lives in General. To which is prefixed an Account of Places which are in the Disposal of the Lord Mayor, Aldermen, and Common Council of the City of London, also of others more immediately belonging to the Crown; being collected from the latest and best lists extant; wherin is shown the Nature and Respective Business of the Principal Officers, and in whose Gift most of the said Places are. The whole being Interspersed with Directions and Instructions for obtaining Places in General. By Richard Hayes, Teacher of Merchants' Accounts in Great Eastcheap, Author of the New Method for Valuing Annuities upon Lives. London: Printed for W. Meadows, at the Angel in Cornhill, M.DCC.XXVIII.")

Early Tables of Compound Interest.—"For the *second part*, which consists of *simple interest* and rebate, at several *rates* and *times*, they are already in every man's hands: And for *tables* of *compound interest* at several *rates* and *times* (for one pound only) are no *new things*: But the first that did ever take the pains to render them in such a form, as to resolve, by them, all such questions as relate to *anatocisme* or *compound interest*, by *addition* and subtraction only, without *multiplication* or *division* (as these will do), I account myself the only *drudge*; it being rather *labour* than *art* that brought it to what it is here rendred: And now, if any person shall object that the *pounds, shillings, pence, and farthings* will not answer in all cases (exactly) to what *decimal fractions*, to *eight, nine*, ten, or *more places* will afford; I answer it is true, and I know it as well as himself: But this Enchiridion was not published for carping *criticks*, but for the use and benefit of honest dealers one with another; and it is of sufficient exactness to perform whatsoever is promised by it: and yet that exactness (as may be acquired) is not omitted; for if he please to advise with the later part of the Second Book hereof, in those particulars, he may there receive ample satisfaction to his expectation."

Rates of Interest in 1693.—"Concerning the using of these Tables, they are to be used all in the same manner, but each Table may most properly be appropriate to the nature of the thing to be purchased; as—

"1. The Table of five per cent. may most fitly be used in the purchasing of *freehold land*, which for its permancy, and being (of all other purchases) least liable to casualties, a man may, for the less profit, part with his money in such purchases.

"2. The Table of six per cent. (which is the present authorized rate for money) may most fitly be used in the purchase of *copyhold estates*, and in *leases of land*, the one being subject to *fines* upon every *alienation* and other services; the other being but for term of years, and so may want encouragement for the improvement of the same.

"3. The Table of *eight per cent.* may be used in the purchase of leases of land, and of good new built *houses* well *inhabited*, and standing in probable places for habitation.

"4. The Table of *ten per cent.* may be used in the purchase of leases of *indifferent houses*, for such are liable to many *casualties*, as wind, rain, fire, and such like, so that no man will lay out his money upon such leases, but he will have at least *ten per cent.* profit for his money."

Assurances upon goods from robbers and upon lives.—"Other Assurances are made upon goods that are sent by waggon or cart, &c., by land, from all robbers, or thieves, &c. Other Assurances are made upon the lives of men and women, at a rate that is moderate; for by this means, if you buy any place or office that is worth £1,000, or more, or less, and you have not money enough to purchase it, you borrow £400 or £500. Now, if you die, and are not in a condition to pay this money, it is lost: But if you ensure your life, then your friend that you did borrow it of, will have his money honestly paid him. Some Assurances are likewise made on the heads of men; as, if a man going for the *Streights*, and perhaps is in some fear that he may be taken by *Moors*, or *Turkish* pirates, and so made a slave, for the redemption of whom a ransom must be paid, he may (ere he goes on shipboard) go to the *Insurance-office*, and advance a *premium* accordingly upon a Policy of Assurance; and if he be taken into slavery in the voyage, the Assurer or Assurers must answer the ransom that is secured to be paid on the policy."

(The three preceding extracts are taken from an old volume entitled "Panarithmologia, being

$$\text{A}\left\{\begin{array}{l}\text{Mirror}\\\text{Breviate}\\\text{Treasure}\\\text{Mate}\end{array}\right\}\text{For}\left\{\begin{array}{l}\text{Merchants,}\\\text{Bankers,}\\\text{Tradesmen,}\\\text{Mechanicks,}\end{array}\right.$$

And a Sure Guide for Purchasers, Sellers, or Mortgagers of Land, Leases, Annuities, Rents, Pensions, &c., in present Possession or Reversion, and A *Constant Concomitant* fitted for *all Men's Occasions*. Calculated and Published by W. Leybourn, 1693.")

Incident in the Life of Dr. Price.—"To the period nearly in which he was chosen Minister to the congregation at Hackney Mr. Price appears, from the preceding account, to have confined his studies almost exclusively to moral and religious subjects, but the different communications which he made to the Royal Society about this time seem to show that he was becoming less scrupulous in this respect, and disposed to consider philosophical enquiries not altogether inconsistent with the profession of a dissenting minister. In 1769, he wrote some observations addressed in a letter to Dr. Franklin, On the Expectations of Lives—the Increase of Mankind—and the Population of London—which were published in the Philosophical Transactions for that year. In May, 1770, he communicated to the Royal Society some observations On the proper mode of calculating the values of contingent reversions; and in the following December, he addressed another letter to Dr. Franklin On the effect of the aberration of light on the time of a transit of Venus over the Sun, both of which papers were also published in the Philosophical Transactions for that year. In the first of these papers he corrected an error into which M. De Moivre had fallen; and it may not be improper to mention a remarkable circumstance which attended the composition of it. From the high opinion which he entertained of the accuracy of De Moivre, he conceived the error to be his own rather than that of so eminent a mathematician, and in consequence puzzled himself so much in the correction of it, that the colour of his hair, which was naturally black, became changed in different parts of his head into spots of perfect white. All this must have arisen from his usual diffidence in his own abilities; for no other cause can be assigned for his doubts and difficulties in a case which really admitted of none."—(Memoirs of the Life of the Rev. Richard Price, D.D., F.R.S. By William Morgan, F.R.S.)

Competition in Fire Insurance.—"The competition which causes the low rates brings *bad risks* and *doubtful customers*, together with a variety of evils, such as *wilful fires*, *lawsuits*, and consequent loss both of money and character, to the officers.

"The civil consequences of competition in this business are apparent to all who have had the adjustment of claims for loss by fire, particularly in the inducement it holds out to evil-disposed and dishonest tradesmen, and others to commit a crime that of late years has been but too common.

"It is an undoubted fact that wilful fire-raising and fraudulent and excessive claims have been more prevalent during the last seven to ten years than in all experience of Insurance Companies anterior to that time. This is evidently one of the greatest evils of competition in this branch of business, which causes each company to be so eager or careful of fame, or, more properly speaking, so fearful of being thought illiberal or litigious by the public, as to induce them rather to submit to be cheated, and made to pay fraudulent claims, than to evince the least indisposition to resist, or to endeavour to make an example much needed. This is a concomitant evil on competition; its influence has been generally felt; and all offices, one time or other, have been obliged (in order to maintain a character for promptness and liberality) to settle claims, where serious misgivings have been felt as to the cause of the fire, and in other cases, where no grounds for suspicion as to the origin of the fire have existed, have had to contend with the most exorbitant and unfair claims."—(Practical Remarks on the present state of Fire Insurance business, &c. By Fred. G. Smith, Esq., 1832.)

A Plea for Life Assurance.—"Many men intend to assure, but still they allow year after year to slip away, and the duty unperformed. Lolling in easy comfort in their warm homes, they cannot bring their minds to admit the possibility of their family being destitute. Let such parents—and they are too common—contemplate for one moment on what a precipice their offspring rests; hanging by the slender thread of life of him to whom they owe their own existence—a life which no sooner ceases than the brittle fabric on which they stood dissolves and leaves them beggars. Think for one moment of such a fate for those you have nurtured; rather bring them up in penury and want—inure them to all the privations which poverty brings in its train—rear them on coarse and humble fare—teach them from infancy to toil for daily bread, and then, when you are gone, the change will not be great; but do not make the luxuries of life necessities and then rudely deprive them of them. Let no man, therefore, rest till he has done this act of duty, called upon imperatively to perform by all the laws of God. Let him rouse his heart to a full sense of the fatal error he is labouring under; let him use every means in his power to make this provision *now*, so that he may be enabled to lay his head upon his pillow each night in the knowledge that, should he never see another sun, he has conferred a great boon upon his family, by leaving behind him the means of placing them at least beyond the reach of want." (A Plea for Life Assurance. By James Wyllie Guild, A.I.A., Accountant in Glasgow. Glasgow, 1850.)

REPORTS OF ASSURANCE COMPANIES.

In presenting to the readers of the *Assurance Magazine* the following condensed Reports of the various Assurance Companies, which have already appeared in the *Post Magazine* and other Public Journals, our only object has been to select the facts which represent the progress of the Companies or of Life Assurance in general in Great Britain. We have therefore only given such statements as were made in the Reports themselves, or, in reply to the questions of proprietors, by the Chairman or other official authorities. We have commenced the Reports from the end of August 1849, and intend in the following number to continue them to the end of August 1850, so that an entire year of the business of Assurance will be brought before the notice of the reader, as far as publicity is given to the affairs of these great Institutions. It is much to be desired that some of the older or the Proprietary Companies, which have not hitherto given their general summary, would add to the information here contained; a full collection of which would show the progress of the people in one of the most important points of political economy, viz., the number and the proportion in which they are, with a careful forethought and prudence, providing for their families, and preserving them from those sudden reverses and calamities which these valuable institutions are so useful to avert.

Ægis Life Assurance Company.—First Annual Meeting, March, 1850. The Company's Deed of Settlement was completely registered in the month of December, 1848, and shortly afterward a payment of 10s. per share was called for, to meet the preliminary and working expenses. In April, 1849, the Directors commenced business by issuing policies of Assurance on Life, and, from that time to the 31st December last, the Company received 113 proposals for assuring £65,039, of which, 42 were rejected, and 68 accepted and completed. The large proportion of rejected proposals arises from the caution which the Directors deemed it proper to exercise in a year distinguished by the fearful visitation of cholera. These 68 proposals assure in the aggregate the sum of £35,380, at annual premiums amounting to £1,200 16s. 7d., and each policy averages £520. The 68 policies include 7 in connection with loans by the Company to the assured. Not a single policy has become a claim by the death of an assured.

An arrangement made with the Union Fire and Life Office, has been carried into effect, by the introduction to that office through the agency of this Company of 239 Fire Policies during the three quarters of the year, insuring property to the extent of £280,260, the commission on which amounts to £57 6s. 6d.

The Balance Sheet showed that the Receipts had been from deposits on shares, £1,145; premiums, £1,258 3s. 1d.; cash received for investment, £1,586 16s. 8d.; office fees and property tax, £6 16s. 3d.; making a total of £3,996 16s.; which is thus disposed of—preliminary expenses, £975 8s. 2d.; expenses of the last year, £985 7s. 11d.; advanced on loans, £835; cash at bankers, and petty cash, £623 19s. 2d.; value of furniture, &c., £415 10s. 2d.; policy stamps, and premiums unpaid, £161 10s. 7d.; making the sum total, £3996 16s.

It was resolved, as soon as the legal forms could be complied with, to increase the Directors from 12 to 14. A dividend at the rate of 5 per cent. per annum, free of Income Tax, was declared. The sum of 484 guineas was awarded to the Directors, being 1 guinea for each attendance since the formation of the Company, and 10 guineas to the Auditors.

Alfred Life Assurance Society.—Annual Meeting, held August, 1850. The accounts exhibit an increase of the Assurance Fund, during the past year, of £15,704, making a total of £84,104 9s. 3d., being a considerable increase on the amount carried in the previous year.

The premiums on new policies issued during the year amount to £3,478 9s. 2d.

The claims that have accrued during the year, (including the bonuses,) amount to £2,416 19s. 9d.

The income of the office now amounts to £24,213 2s. 9d.

The following is an abstract of the Balance Sheet:—

LIABILITIES.	£	s.	d.	ASSETS.	£	s.	d.
Value of sums assured	176,800	13	8	Value of Premiums	1[illegible],116	10	11
Paid-up capital	16,800	0	0	Government securities	40,983	5	1
Assurance fund	84,104	9	3	Mortgages	34,331	18	1
Annuity fund	19,712	19	4	Reversions	13,346	0	8
Building fund	8,220	0	0	House in Lothbury	13,400	0	0
Stretton Friendly Society	1,218	1	4	Railway debentures	8,705	0	0
Interest due to Propiretors....	417	0	0	Value of re-assurances	5,198	15	9
Assurance claims	1,225	9	9	Balance at Bankers	2,922	14	9
				Premiums due.......	1,006	1	5
				Sundry accounts..............	458	6	8
	308,498	13	4		308,498	13	4

A resolution was agreed to explaining or amending the rule of the association "which authorises the advance on the security of a Policy of Assurance, of the whole amount of the sum assured, if satisfactory security be at the same time given for the payment of the future premiums upon such policy, and the interest of the money advanced, so as to allow of the acceptance of the bond or covenant of the borrowers, and of one or more surety or sureties, as a satisfactory security for the payments aforesaid." The Directors not being sure, whether they possessed the power of lending money on personal security under the Deed of Settlement, as it at present stood.

In reply to the question of a member, the Chairman believed that he might say on the part of the board, that it was the most anxious wish of the Directors to convert the office into a Mutual Society. They considered, however, that next year, being the period when the second quinquennial division of profits would take place, would, under all the circumstances, be better suited for making the alteration than at present.

Alliance Marine Assurance Company.—Annual General Court of Proprietors held January, 1850.—The usual dividend of 6 per cent. or 30s. per consolidated share was declared for the ensuing year, one moiety of which would be payable on or after the 17th January, and the other on or after the 11th July next. The Report also stated that the balance in hand and the general state of the accounts would justify an additional payment to the Proprietors by way of bonus, to the extent of 30s. per consolidated share, to be made payable with the first moiety of the yearly dividend. The Directors recommended an alteration of tne 51st section of the Deed of Settlement so as to enable them to appoint agencies under such limitations and restrictions as they might think necessary.

Atlas.—The 42nd Annual General Court of Proprietors holden July, 1850.—The Directors draw the attention of the Proprietors to the circumstance that the first period of five years for the declaration of a bonus on the Life Policies of the Company conformably with the new regulations made in 1848, by which quinquennial were substituted for septennial divisions, expired at Christmas, 1849, to which last mentioned period the valuation of the liabilities and assets was made up.

The Total Life Surplus or Profits for Great Britain and Ireland together, for the 7 years up to Christmas, 1844, amounted to	£262,472	14	8
While a like Surplus for the shorter term of 5 years just ended, amounts to nearly as much, namely, to	£246,995	6	2

The surplus in each case being actually realized and not anticipatory.

Of the surplus up to Christmas last, the Directors have appropriated to the Life Policies in Great Britain and Ireland, respectively the sum of £193,364 14s. 11d., retaining £53,630 11s. 3d. as a cautionary reserve, kept back to be improved at compound interest, for the exclusive benefit of the policy holders.

The following facts are given for the information of the Proprietors.

The accumulated funds from Life Premiums alone, now amount to	£1,353,436	6	6
The annual income of the Life Branch, exceeds .	170,000	0	0

The progress of the Company will be exhibited by stating that when the bonus system was adopted by the Directors in 1816, the accumulated premiums amounted to no more than £69,349 1s. 4d., while as before mentioned they now exceed £1,353,436, and that the annual income of this branch, which in 1816 was about £22,674, has now increased to upwards of £170,000.

The addition to the new policies issued within the last 5 years varying with the age of the parties, has been, for Great Britain, on the average nearly two per cent. per annum on the sum assured; but much larger on Policies which have been in force from 1816.

The premiums on new Life Policies have been greater in amount for the last than in many preceding years.

British Empire Mutual Fire Assurance Company.—Annual Meeting, held 30th August, 1849. The total number of Policies completed up to Midsummer, 1849, was 1,557 for £659,080, upon which the premiums amounted to £988 14s. 8d. In addition to this, 168 proposals for £60,894 had also been received, which then remained to be disposed of.

A large and influential agency, consisting of 195 agents, had been established throughout the country.

The total formation expenses of every kind, including those of the above agents' outfits, costs of Deed of Settlement, &c. only amounted to £617 3s. 10d., though it will be found that the ordinary formatory expense of opening a Fire Office, exceeds five times that amount.

The total losses to the end of the first year, amounted only to £57 6s. 6d. for six fires, being less than 6 per cent. on the premiums received.

British Empire Mutual Life Assurance Company.—Meeting held 26th February, 1850.—Third Annual Report for the year ending 31st December, 1849.—The following statement shows the progress of the Company during the three years of its existence.

	General Life.	Amount.	Investment Assurances.	Amount.
		£		£
1847 Policies effected	266	49,918	192	13,566
1848 ,, ...	318	47,059	523	30,706
1849 ,, ...	721	108,122	450	26,253
Total in 3 years....	1,305	205,099	1,165	70,525

The balance of the money advanced on the formation of the Company has been paid out of the premiums received, and the Company is now freed from all liabilities except the amounts assured by the Policies issued. The income from premiums amounts to £9,884 16s. 1d. per annum. The Company has already realized a capital of £9,240 16s. 10d., a large portion of which is invested in advance to the members on various securities.

Notwithstanding the prevalence of the recent epidemic, the claims by death have been only £1,091 during the three years, being far below the amount estimated by its Tables.

Catholic Law and General Life Assurance Company.—Fourth Annual Meeting, held on Thursday, 25th July, 1850.

The report stated that only two deaths had occurred in the last two years, one for £500, and the other for £200; both were Irish lives. The number of lives assured between 1st June, 1849, and 31st May, 1850, was equal to double the number assured during the similar preceding period. In the years 1849 and 1850, proposals were made for 138 policies, the united amounts of which were £52,963 2s. 6d; of these, 123 were accepted for £45,125 6s. Independently of the two policies lapsed by death, 16 others have fallen in during the year, representing a sum of £6,048, and upon which £320 3s. had been received. Since the commencement of the Company's operations, to the 1st June, 1850, Assurances had been effected to the extent of £110,972 12s. 6d., producing in annual premiums, £3,732 16s. 11d.; but of these, 54 had lapsed, representing £23,990 16s. 6d., on which the annual premiums amounted to £741 1s.; so that the yearly income of the Society, on the 1st of June last, was £2,991 15s. 11d. The report also stated that judicious and energetic measures had been adopted to extend the business of the Company in France, and that under the favour of the Archbishop of Paris, and other ecclesiastical authorities, numerous priests had promised and given them their support,—that in the limited space of four months, various prospectuses, a complete set of tables, books of instructions, &c., had been translated or written, published, and circulated, and that every great town and city, and every place of note in the various Departments of France, has now an agent of the Company, and that in addition, they have four French travelling agents constantly traversing that great kingdom.

At an Extraordinary General Meeting in August last, it was resolved that the nominal capital should be reduced from £1,000,000 to £200,000, and the number of shares from 50,000 to 10,000; of the latter number only 1,320 remained unallotted previous to the Directors circular to the Shareholders on the 10th June, inviting them to take additional Shares. Since then 202 shares have been allotted, leaving only 1,118 shares to be disposed of.

A resolution was carried "that it is the opinion of this Meeting that the paid up Capital of the Company be increased, and that the Directors be requested to take into consideration the mode of effecting the same."

Church of England Life and Fire Association.—Annual General Meeting held 14th June, 1850. It appeared from the report, that the new Life Policies issued in 1849, exceeded those issued in any one year since the formation of the Society, and that the claims were much less than expected.

In the Fire Department the losses did not exceed one third of the receipts.

City of London Life Assurance Company.—Annual Meeting, January, 1850. It appears from the report, that the number of new policies issued, from the 1st November, 1848, to 31st October, 1849, was 148, assuring the sum of £66,097 11s. 2d., and producing an additional income of £2,263 9s. 3d.; there had also been 31 proposals for assuring the sum of £16,102, declined. The total number of policies in force, on 31st October last, was 597, assuring a sum of £209,729 2s. 10d., and producing (after deducting the premiums upon all lapsed policies) an annual income of £7,766 14s. 1d. To these had been since added 16 policies, assuring £5,747, and increasing the annual income to £7,998 2s. 10d. On the termination of the third year, it was announced that one claim by death for £500 had become payable. During the past year, one claim for £1,000 only had occurred from death by cholera. The report stated that the Directors had taken additional offices in Waterloo Place, Pall Mall.

The Balance Sheet showed Receipts under various heads	£20,844	10	4
Per Contra, Charges of Management, Incidental Expenses, Dividends paid to Proprietors, &c.	6,037	19	10
Balance Amount on Mortgage Exchequer Bills, &c., Cash at Bankers, Short Bills, and Cash on hand	14,806	10	6

The Chairman explained that the amount paid for Rent, £528 10s., included in this case attendance, lighting, taxes, and coals.

A dividend of 5 per cent. per share was declared, being the same as the last.

Clerical, Medical, and General Life Assurance Society.—General Meeting, 7th March, 1850. The Act of Parliament, which received the Royal assent June 1850, authorises some important changes in the regulations of this Company. It is proposed to appropriate £50,000, out of the present Reserve Fund of £51,500, as a permanent security for the Proprietors and the Assured, the interest of which will be annually added to the profits of the Society, and divisible amongst those entitled to share therein. Five-sixths of the profits will in future be divided amongst the assured, instead of three-sixths, as before, and the two-sixths which were formerly added to the Reserve Fund, will, under the Act, be distributed amongst the Assured. The Consolidated Fund has now reached the large amount of £746,756, from £695,155 in the previous year, being an increase of £51,501 within the past year, ending June, 1849, compared with £38,340 in the preceding year. This amount of the Fund is independent of the paid-up Capital belonging to the Proprietors. The two first divisions of Bonus averaged 22 per cent. on the premiums paid; the third 28 per cent.; and the fourth, declared January, 1847, rather more than 36 per cent.

Colonial Life Assurance Company.—Annual Meeting, November, 1849. In the Report by the Directors it was stated, that during the year 25th May, 1848, to 25th May, 1849, 205 new Policies have been issued, assuring sums to the amount of £129,938 15s. yielding annual premiums to the amount of £4,635 10s. 9d.

The whole amount of assurances offered to the Company from November, 1846, when the first Policy was issued, till 25th May, 1849, is £505,855 3s. and of this amount, after deducting proposals rejected, and assurances forfeited, there was in force at the date of Balance, the sum of £353,476 9s. yielding annual premiums to the amount of £14,279 9s. 6d.

The amount of claims since the establishment of the Company is £2,070 15s. 3d.

The Chairman stated that assurances for £100,000 had been declined by the Company.

Eagle Assurance Company.—Annual General Meeting. The Directors laid before the Meeting the Report from the Auditor as follows:—

Account of Receipts and Disbursements for the year ending 30th June, 1850.

INCOME OF THE YEAR.	£	s.	d.
New Premiums received	5,557	6	1
Old "	91,940	16	9
Total	97,498	2	10
Annuities and Interest on Mortgages	15,069	7	6
Dividends on funded property .	10,233	6	7
Sundries	128	9	1
	122,929	6	0

CHARGE OF THE YEAR.	£	s.	d.	£	s.	d.
Dividends to Proprietors	6,118	5	0			
1 per cent. extra ..	158	11	0			
				6,276	16	0
Claims on decease of lives assured	70,644	13	1			
Bonus thereon	4,608	1	8			
Policies surrendered	3,350	10	3			
Annuities granted..	1,702	18	10			
				80,306	3	10
Commission	3,335	16	9			
Medical fees	393	3	0			
				3,728	19	9
Income tax				808	16	6
Reassurance				2,781	14	2
Expenses of Management				5,326	9	4
Sundries				191	15	6
Balance or surplus receipts ..				23,508	10	11
				122,929	6	0

Statement of Liabilities and Assets.

LIABILITIES.				£	s.	d.	ASSETS.	£	s.	d.
Interest, &c. due to Proprietors				4,517	19	9	Amount invested on Mortgage and Life Interests	312,540	17	0
Sundry accounts				430	3	10	Do. in Reversions	11,194	11	0
Paid capital account	121,572	15	0				Sundry accounts	3,707	1	6
Assurance Fund .	551,120	11	1				3 per Cent. Consols	74,336	0	1
				672,693	6	1	3 per Cent. Reduced Annuities.	70,039	1	11
							3½ per Cent. Do.	154,261	0	9
							Consolidated Long Annuities .	9,014	15	11
							Cash and Bills receivable	12,174	3	2
							Advanced on the Company's Policies	20,700	17	9
							Stamps	59	17	6
							Agents' balances..............	9,613	3	1
				677,641	9	8	£	677,641	9	8

The premiums received for new Assurances are somewhat less than in the preceding year, the lives assured being younger, and the number of term policies greater, but the amount assured is higher in the present year. In the year ending June, 1849, 266 Policies, averaging £624 each, were effected; in 1850, 262 Policies, averaging £656 each.

The sum paid for claims considerably exceeds that for the preceding year, in some measure owing to the prevalence of cholera, 8 deaths having been reported by that disease, but the average amount assured by each was only £370. The average annual amount of claims paid in the three years, since the last division of Surplus in 1847, is £57,571.

In the last Report the Directors stated the expenses to be £400 less than they were the year preceding. They now report a further diminution of £546, making a reduction of £946 in the two years.

The General Fund has this year been increased by £23,508 10s. 11d., and it now amounts to £551,120 11s. 1d.

The Chairman stated that when the Proprietors last met, they were informed that the last two years' business was more than double the separate transactions of the Eagle Company in the two years previous to the amalgamation, and the business of the present year has progressed in the same manner, and that, with regard to the expenses, whereas formerly those of the Eagle were about 8 per cent. and those of the Protector not far from 12 per cent. on the premiums received, the rate was now reduced to little more than 5 per cent. in consequence of the amalgamation.

Edinburgh Life Assurance Company.—Twenty-sixth Annual General Meeting, held 11th December, 1849, being the third Periodical Declaration of a Bonus to the Policy holders.—The Report for the year ending 31st August, 1849, was read, showing that the new business of the last year was larger than in the two preceding years, both in the number of new Policies and in the amount of premiums thereon. The bonus now proposed considerably exceeded the amount declared at the previous investigation; on Policies effected at the commencement of the Company, the Bonus ranged from 2 to 8 per cent. per annum for the last seven years on the sums assured, and in two of the instances specified, the total bonus exceeded in amount the sum originally assured.

A Resolution was agreed to, authorizing the Directors to appropriate during the interval between the investigation, to policies of more than five years' duration, becoming claims in the intermediate period, a certain annual bonus, not to exceed three-fourths of the rate fixed at the last previous septennial investigation.

A Resolution was also agreed to, that in future nine-tenths of the divisible profits should be allotted to the assured, in the place of four-fifths, as at present.

Resolutions, relative to fixing the amount of the Proprietors' Guarantee Fund, and also others relative to a proposed reduction in the number of ordinary directors, and increasing the amount of their remuneration, were also submitted and agreed to, subject to confirmation at an Extraordinary Meeting, on the 2nd January, 1850.

Engineers' Masonic and Universal Mutual Life Assurance Society. Second Annual Meeting, March, 1850. During the year 1849, 748 proposals for assurance, to the amount of £192,030, have been submitted to the Board, 60 of which have been declined, 45 stood over for further consideration or completion, and 643 Policies, securing the sum of £165,270, and producing premiums to the amount of £5,047 2s. 4d., have been completed.

The total number of Policies completed to 31st December, was 851.

The annual income derivable from premiums, £7,113 5s. 11d.

Only 7 claims from death to the amount of £1,250 have arisen.

Statement of Policies completed.

	1848.	1849.	Total.	
£2000 and upwards.........	0	5	5	
1000 and under £2000......	23	33	56	
500 " 1000......	30	78	108	
200 " 500......	70	198	268	
100 " 200......	78	248	326	
Under 100......	7	81	88	
	208	643	851	on 815 Lives.

English Widow's Fund, and General Life Assurance Association. Second Annual Meeting, February, 1850. From the Report it appears that during the year, 195 Policies representing Assurances amounting to £50,576 14s. and producing an annual income of £1,692 19s. 1d,, have been issued, exceeding the total amount assured in the previous twelve months by £11,894 5s. 0d.

From the commencement of the Association, 363 Policies, covering assurances amounting to £89,259 3s. have been granted. The gross annual premiums thereon being £2,914 3s. 6d.

Three claims have arisen from the decease of Policy holders.

Interest at 5 per cent. per annum on the paid up capital to the 31st December last, will be payable to the sharehblders from and after the 1st February.

Equitable Society.—From the interest and importance of the statements made by Mr. Morgan, in the address delivered at the General

Court holden in December, 1849, for the decennial Division of Profits in this Society, it would no doubt be gratifying to our readers if the whole of it could be given. It would serve to show the progress of a Society of such consequence in the history of Life Assurance; but the want of space will only allow of the following extracts, in which the principal facts are contained, and of the insertion of the Balance Sheet of the Liabilities and Assets, on 1 Nov., 1849, and the Cash Account for the Year 1849:—

"It appears from the accounts now laid before the General Court, that a further addition of one per cent. to the sums assured in all the Policies entitled to additions on the 1st of January next, will amount to £1,398,098; and owing principally to the advanced age of the Members assured before the year 1817, will require £1,056,686 to provide for it, being after the rate of £75 12s. for every hundred pounds added, and answering to a mean age of 68 years.

In 1839 the amount of a similar addition was £1,637,864, and its value £1,187,554, or after the rate of £68 4s. only for every £100 added, the mean age being then 60 years; this increase of 8 years in the average age at which the present additions are valued, arises on the Policies dated before 1817, in which the average age of the lives assured exceeds 70 years, whilst the average age of the lives assured in the remaining 5,000 Policies does not exceed 55 years.

The rate of the addition (£2 per cent.) will indeed be less on the present than on either of the three preceding divisions of profit; but it will be seen that the amount added to the Policy of every Member assured with the Society before the year 1817, with a very few exceptions, exceeds, and in many cases exceeds considerably, the addition made in any previous division; I may well, therefore, I think, repeat to such of those Members as now survive, the congratulations on the present, which the Actuary has had the pleasure of offering them on many previous occasions of this kind."

* * * * *

"A large proportion of the surplus in 1800 and in 1810 had been produced by the accumulating residue of the Surplus left on preceding divisions; and it was clear the same would again appear to have been the case in the then approaching investigation of 1819. The Society was possessed in 1816 of near six millions and a half of stock, and had half a million sterling laid out on mortgage at 5 per cent., with a large Surplus Annual Revenue to accumulate for many succeeding years, irrespective of any additional income it might derive from new Assurances. A large portion of the advantage therefore since derived from the increased value of the Funded property of the Society would have accrued without the aid of a single new Insurance; in which case these advantages might have been augmented by the appropriation of the whole of the Surplus Stock to the Old Insurers. The benefits therefore which the Insurers, since 1816, have derived under the system then established, cannot, I repeat, be justly compared with those obtained by the older Members, who were previously in the possession of such superior advantages.

But the expectations of new Members, although postponed by the regulations of 1816, were not, as was justly observed on a former occasion of this kind, "taken away;" the provision remained, that the profits from all sources should be left to accumulate for periods of ten years, and that one-third at least of the surplus should be always reserved for the benefit of future as well as of present Members; and the result, as appears by the accounts now laid before the General Court, is, that notwithstanding the enormous sum paid in Additions in the course of the last thirty years to the families of its deceased Members, the Society now possesses a Capital, larger by upwards of £1,750,000 than it did on the 31st December, 1816—has at this time to apportion among the restricted number of 5,000 a larger surplus than was shared in 1819—20, among more than 8,500 Policies, and consequently retains a larger reserve for the benefit of the Members assured since 1816, who now take a greatly preponderating interest in this large accumulating fund, and in the accumulating profits which are to be divided together with it at the end of the ensuing decennial period. I may truly say a "preponderating" "present Interest,"—for of the 1676 Assurances dated before the 1st of January, 1817, now remaining in force,

8	are on Lives above 90
954	between 70 and 90
579	,, 60 and 70
114	,, 50 and 60
21	,, 40 and 50
1676	

Of these, if reduced by the law of mortality alone, it may be calculated that not a third will remain in force in 1860; nor, if the number of surrendered Policies of this class be in proportion to that of former years, is it probable that more than a fifth of the above number of Assurances will be continued to partake of another decennial division; in either case the amount absorbed in an addition to these Policies, notwithstanding their long standing and enhanced value, can bear but a small proportion to the sum required for the additions on the remaining number of participating Assurances in 1860. Thus, in addition to the profits already apportioned among them in additions paid and additions assigned on their Policies, equal to more than the actual payment of three quarters of a million, the Members assured since 1816 have under the system established at that period, a reserve now made for their exclusive benefit of a present sum of nearly One Million Sterling, and thus possess an expectancy far greater than has been secured to the members of any other Institution of the same kind which has been established in this kingdom during the last thirty-five years.

And whilst the Members assured before 1817, by an undeviating adherence to their compact with the Members who have since joined the Society, have thus placed the interests of the latter in so commanding a position, the benefits they have themselves realized, are, I believe, altogether unparalleled:—

The aggregate amount of the additions declared:—

			£		£		Per cent.
In	1819	was	3,300,000	on	11,235,507	assured	= 29.37
	1829	,,	5,036,379	,,	7,826,829	,,	= 64.3
	1839	,,	3,850,295	,,	5,065,948	,,	= 76.05

and the additions now proposed amounted to £2,061,596 on £2,627,441 assured in these remaining Policies, being after the rate of £78.40 per cent., making, with the additions on the three former occasions, a total of £14,248,270, added on these Policies since the restriction was imposed in 1816 on the number of Assurances, which should thereafter partake at one and the same time in the appropriation of the Surplus."

* * * * *

"The regulations of 1816 left the Society still open to the public to profit by the unquestionable security afforded by its vast Capital and large Reserved Fund, and to partake gradually of the benefits of, and carry on a system productive of such great advantages to the families of their predecessors. Nor have the public neglected to avail themselves of the offer. And the result has been the formation of a constantly increasing body of new Members; whose aggregate Assurances have amounted to £9,943,294, and whose Policies at this time remain in force for £5,558,500; of which sum £4,326,434, is bearing Retrospective and Prospective additions, and £1,232,070 assured in 1114 outstanding Policies, is rapidly succeeding to that privilege.* Of this outstanding sum, above a million is on lives under 45 years of age: and these, as well as a large proportion of all the Policies admitted (among the 5000) for several years past, which are on lives still under 50 years of age, will, agreeably to the uniform experience of the decrements of life in this Society for the last 80 years, be large contributors to, as well as large participators of, its surplus for many years to come."

* * * * *

"Conducted through a long and eventful period of 86 years with great prudence and the strictest economy, the Equitable Society has received at the hands of its several Members—for Premiums, Extra Premiums, and Entrance Money—the net sum of £19,067,636; and suffering no part to be diverted to any other object than the security and mutual benefit of all its Members, has, by the powerful, long-continued, and uninterrupted operations of compound interest, been enabled to redistribute in the same period, in claims, additions to claims, and purchases of individual interests, the amazing sum of £25,336,637 (of which eight millions nearly have been paid within the last 10 years); to retain at this moment a further sum of £8,800,000 in capital; and to add (retaining a million in reserve) near three millions more to the sums assured in the oldest 5,000 Policies now existing, whereby its present engagements will be augmented on the 1st of January next to upwards of £14,100,000.

* The amount of the Retrospective additions on the 1st of January next, will be £843,439, of which £734,598 is now to be added. Value £503,330. Amount of Prospective additions would be £86,528 per annum on the £4,326,434, but will necessarily increase as fresh amounts (about £300,000) are added yearly by annual admissions of new Assurances to keep up the constant number of 5000. The sum *paid* in Prospective additions in the last ten years has been £400,000, which has been a charge on the growing profits, and together with £70,000 paid for the income-tax, has equalled nearly the income derived from the reserve of 1839, taking the 3 per cents. at 90. On a moderate estimate a quarter of a million will be paid for Prospective additions on claims arising out of the Assurances of these new Members in the course of the next 10 years.

It should not be omitted in this statement that the whole expenses of management of every kind have amounted only to £418,236 in the whole period; and that if it had resorted to the modern practice of paying a commission of five per cent. on the premiums as they were received, £953,381 16s. would have been ALIENATED altogether from the funds of the Society; a sum which, with its accumulations at compound interest, would go far to provide for the additions to be made on the present occasion."

Balance Sheet of the Equitable Society on the 1st November, 1849.

Dr.	No. of Policies.	Amount.	Value. £	s.	d.
To the present value of all the Sums and Annuities assured on the 1st of November, 1849	6,044	£8,305,495 An. £6,138	5,594,158	8	6
To the present value of all the additions		£2,974,614 7 6 An. 47 3 6	2,820,719	15	0
To the present value of the several Life Annuities paid by the Society..			11,515	16	5
Amount of Claims allowed but unpaid, November 1, 1849..			228,261	10	0
			8,154,715	9	11
Surplus			3,215,503	14	0
Two-thirds of the above surplus		£2,143,669 2 8			
Present value of a further addition of £2 for payments made prior to January 1, 1850, on the Assurances dated before December 11, 1840, constituting the oldest 5000 Assurances, January 1, 1849		2,113,372 12 0			
		£	11,370,219	3	11

Cr.	£	s.	d.
By the value of all the Annual Premiums, amounting to £245,149 1 6	2,512,171	6	0
By £2,275,000 Stock in the 3 per cent. Consols, at 93⅜	2,129,168	15	0
By £2,680,000 Stock in the 3 per cent. Reduced Annuities, at 92½	2,479,000	0	0
Cash on Mortgage	3,753,346	18	3
Annual Premiums due in October, November, and December unpaid	42.501	15	0
Interest due on Mortgages	25,737	2	3
Balance at the Bank, October 31, 1849 (which includes the amount of a large Mortgage recently repaid, and not yet invested	427,493	7	5
£	11,370,219	3	11

We append the General Cash Account of the Equitable Society, for the year ending 31st December, 1849.

Dr.	No.	Sums Assured.	Cash Received. £	s.	d.
Amount of New Assurances..	132	£450 An. £146,150 ...	5,592	18	6
Entrance Money and Policy Money			818	0	6
Extra Premiums for Sea and Foreign Risk			678	2	0
Annual and Commuted Premiums and Forfeits on Old Assurances			246,850	10	0
Dividends on Stock			150,000	0	0
Interest on Mortgages			165,641	6	1
			569,580	17	1

	£	s.	d.
To Cash re-paid which had been lent on Mortgage	372,501	17	0
To the produce of £90,000 Stock sold	81,431	5	0
To Balance, 31st December, 1848	35,968	19	1
	£1,059,482	18	2

Cr.	Lives.	Policies.				£	s.	d.
By claims paid	180	230				337,146	4	0
„ Additions to those claims						275,669	10	0
„ Annuities to claimants, &c.						1,887	19	6
„ Income Tax						9,198	16	7
„ Stamps						679	9	6
„ Returns of Premiums and Forfeits						372	7	0
„ Sundry Disbursements, viz.:—								
General Expenses			556	10	1			
Ground Rent, Rates, Taxes, &c.			458	5	3			
Printing and Stationery			134	15	5			
Salaries, and Income Tax on do.			3,417	5	10			
Gratuities pursuant to Order of General Court			3,410	0	0			
Directors and Auditors for 1849			2,072	18	4			
Law Expenses, Ordinary			161	19	10			
Do. on Transfer of 83 Mortgages			807	17	4			
						11,019	12	1
„ Cash paid for 24 Surrendered Policies (on 22 Lives)						6,770	18	6
„ „ for £16,686, Additions Surrendered						11,856	17	0
„ „ for Stock and Exchequer Bills purchased						203,762	2	5
„ Cash laid out on Mortgages						4,000	0	0
„ Balance remaining 31st December, 1849						197,119	1	7
						£1,059,482	18	2

Stock in the Funds:—
£4,955,000, 3 per cents.
£107,000, 3¼ per cents.

£5,062,000.
£100,000 Exchequer Bills.
£3,753,346 18s. 3d. Cash on Mortgage.

Equity and Law Life Assurance Society.—Annual Meeting, March, 1850.—The Report states that during the year ending 31st Dec., 1849, the Directors had received 192 proposals for Assurance; 173 of which they accepted. Of these 149 were completed, assuring £125,483 8s., and yielding, in annual premiums, £3,505 3s. 8d.; while in 1848 there were issued 117 policies, assuring £117,180, and yielding in annual premiums, £3,118 2s. 3d. Since the conclusion of the year, 11 of the proposals previously accepted have been completed, assuring £12,100, and yielding, in annual premiums, £345 18s. The average rate of premiums completed in the year is only £2 15s. 11d. per cent., and the income arising from new business is almost entirely composed of annual premiums. The average amount of each policy is about £850.

The total number of Policies in existence, on the 31st December, 1849, was 542; assuring £515,254, and yielding an income of £14,959 3s. 3d.

No deaths from cholera occurred in the year. Only two claims from death were made, one for £4,000 (£1,000 of which has been reassured) and the other for £1,000.

The number of reassurances now existing is 53, covering an aggregate risk of £79,442 11s. 6d.

The dividends on stock, and the interest on mortgages received during the year, after deducting an estimated sum towards recouping £5,000 invested in Long Annuities, and £200 laid out in the purchase of a Life Interest, amount to £2,547 15s. 4d. The interest paid during the year to the proprietors is £1,204 17s. 11d., leaving a balance of £1,342 17s. 5d. The balance sheet shows the property of the Society to amount to £74,958 10s. 7d., that is, £27,353 10s. 7d. over and above the sum of £47,605, received for deposits on shares—the surplus capital thus exceeding that of the year 1848 by £10,814 8s. 2d.

The amount of Premiums received in each of the five years from the formation of the Society, was as follows:

	Premiums Received.		
	£	s.	d.
In 1845	3,145	14	6
1846	6,579	8	3
1847	9,837	1	8
1848	12,221	8	11
1849	15,117	15	1

During the same time the total amount paid and admitted for claims from death is only £4,800, consisting of the £4,000 (reduced to £3,000 as above mentioned), and £1,800 paid in 1848, whilst the amount received in respect of Policies dropped and surrendered, after deducting the consideration paid for the surrendered, is £4,395 10s. 3d.

Equity and Law Life Assurance Society.—Extraordinary General Meeting, held 6th August, 1850, for declaring profits up to 31st December, 1849.—The Report of the Directors states the results of the operations of the Society, for the quinquennial period up to 31st December, 1849. In accordance with the provisions of the Deed of Settlement, the surplus has been apportioned in the proportion of one-fifth to the proprietors, and four-fifths to the assured entitled to participate in the profits. An addition of 9s. 2d. will be made to each share, and the dividend payable thereon during the current period of five years, will be at the rate of 4s. 6d. per share, being 4½ per cent. per annum (clear of income tax) on the amount of the deposits. Interest at the rate of 3 per cent. per annum has been paid to the proprietors from the commencement; with this interest, and its accumulations, the addition above mentioned is equivalent to a present increase of £1 7s. per share.

The addition to each participating Policy may be received by its holder either by way of reversionary bonus, to be added to the sum assured, or by immediate cash payment, or by a reduction of future premiums for the next five years. The average addition will be fully 50 per cent. on the amount of premiums paid to each Policy on the participating scale, and every Policy which had been in existence for even one year, benefits proportionally in the division. The reversionary bonus will be equivalent in general to a return on each Policy in ready money of one-fourth of the premiums paid, and for Policies which have been in force during the whole of the quiquennial period expired, to a reduction of 30 per cent. on the premiums payable during the current quinquennial period.

The effect of the mode of calculation adopted by the Actuary in the valuation is, that every Assurance, so long as it continues in force, may be expected to contribute equally to the total amount of profits to be declared at each successive division.

While the sum of £57,000 has been received in premiums, and Assurances have been effected to the amount of nearly £700,000, the whole sum paid in claims is £5,900, reduced to £4,900, by a re-assurance effected in another office.

The present income of the Society is nearly £20,000 per annum, and the whole of its funds is invested in Government securities, or unexceptionable mortgages.

A Resolution was submitted to the meeting, empowering the directors to pay a current bonus of £1 per cent. per annum on the amount assured, to each Policy (according to the term on which it is entitled to participate) which may fall in by death, previous to the next period of division.

Gresham Life Assurance Society.—First Annual Meeting, October, 1849.—The Directors in the Report, after stating that no claim by death had occurred amongst 419 assured, give the following

Statement of business transacted during the year :—

Gross sum assured by 419 Policies, being the number issued to July 31st	£149,160	0	0
" " producing an annual income of .	5,615	11	8

Total statement of business submitted or transacted during the year :—

	No.	Amount.
Proposals accepted (each Policy averaging £356) .	419	£149,160
" incomplete and under consideration . .	229	91,452
" declined	284	99,112
Total proposals made to the Society for Assurance	932	£339,724

The following statement shows the number of First Class Lives assured relatively to those on which an increased premium is payable.

Policies issued at ordinary rates, the proposals being on First Class Lives	237
Policies issued at increased rates, the Assurances being on Lives supposed to be somewhat below the average	182
Total	419

In explanation of the large number of Assurances declined, the Directors state that the Society does not undertake the assurance of lives in a state of positive disease, nor even of those in which a strong indication is given of a tendency thereto, but it seeks the Assurance of those Lives which appear after a searching examination to have been declined on insufficient grounds.

The nominal capital of the Society is £100,000, divided into 5000 shares of £20 each; of these 2,548 shares have been allotted, and £6,158 10s. paid, which shows an average of £2 8s. 6d. per share. A reservation is made in the Society's Deed of Settlement; that is, the power of converting the Society into one on the purely mutual principle, whenever the members shall deem such a measure wise and prudent.

The first year's receipts for premiums alone have been more than sufficient to pay the whole expenses of formation and charge of management, besides leaving a considerable surplus. By the provisions of the Deed of Settlement, the preliminary expenditure may be distributed over a period of 7 years, and in this view, £2291 13s. 6d. from premiums received would remain to meet any claims which might arise after having charged the first year's premiums with its proportion. About 200 agencies have been established throughout the kingdom.

Statement of business transacted during the two months of August and September, 1849:—

	No.
Proposals accepted and upon which the premiums have been paid, (each policy averaging £432 15s.)	87
Making the total number of policies effected to this date . .	504

producing an annual income of £7,140 4s. 2d.

The Chairman, in further explanation, stated, that the preliminary and working expense of the Company amounted to £4,541 14s. 8d., whilst the premiums realised during the first year amount to £4,837 4s. 7d.

The sum of 30 guineas was voted to the four Auditors.

In the course of the discussion, an agent informed the Meeting that he had been engaged as Assurance Agent for 15 years, and during that time he had received 500 proposals, the premiums upon which would amount to £4000 or £5000 per annum, and out of that number 44 had been declined, proposing to assure an aggregate sum of £21,000; and another agent stated, that, in proposing Assurances to the amount of a quarter of a million, he had had £100,000 declined.

With regard to the shares, the Chairman stated, that they were willing to entertain applications for shares to a limited extent, but, in preference to offering them at premiums, they intended to require that a proposal for assurance should accompany each application for shares, from and after the present date. In reply to an enquiry as to the amount invested, it was answered that the sum invested up to the 11th October inst., was £15,051 8s., of which £2,629 16s. had been repaid, and consequently there was available for claims on Policies £12,421 12s., besides the premiums on new Assurances effected.

INSTITUTE OF ACTUARIES.

Proceedings of the Institute of Actuaries of Great Britain and Ireland.

First Session, 1848-9. First Sessional Meeting, held at the Guardian Assurance Office, Monday, 29th January, 1849.

The President (John Finlaison, Esq.) in the Chair.

The President delivered a brief inaugural address to the Members of the Institute, and announced that rooms would shortly be opened for the use of the Institute.

A list of works presented to the Institute by Mr. P. Hardy, Mr. Thomson, Mr. Tucker, Mr. Hillman, and Mr. J. Jones, was read.

Mr. Peter Hardy (one of the Vice-Presidents) delivered a complimentary address to Mr. Griffith Davies and presented to him a Testimonial from the Members of the Institute expressive of their gratitude for his services to the Profession of Actuaries on the formation of the Institute, and their admiration of his talents.

Second Sessional Meeting, 1848-9, held at No. 12, Chatham Place, Monday, 26th February, 1849.

The President in the Chair.

The President announced that he had much pleasure in presenting to the Institute his first contribution to the Library, consisting of the following works, viz. :—

Population abstracts of Great Britain for the years 1801, 1811, 1821, 1831, and 1841.
Registrar-General's 1st, 2nd, 3rd, 4th, and 5th Annual Reports of Births, Deaths, and Marriages.
Finlaison's Report on Life Annuities and Assurance.
Kerseboom on the Population of Holland.
Deparcieux's Essai sur les Probabilités.
Vlacq's Arithmetica Logarithmica, 1628.

The following works were presented by Mr. Farren, viz. :—

De Moivre on Annuities, 1st, 2nd, 3rd, and 4th Editions.
Simpson on Annuities, 1st and 2nd Editions.
Simpson's Select Mathematical Exercises.
Laurence on Estates and Richards' Gentleman's Steward.
Dodson's Mathematical Repository. 3 vols.
Price on Reversionary Payments, 1st, 2nd, 3rd, 4th, 5th, 6th, and 7th Editions.
Farren on the Doctrine of Life Contingencies.

A paper was read presented by Mr. Griffith Davies, F.R.S., on the Construction of Logarithms.

Mr. Jellicoe (one of the Vice-Presidents), delivered a short Lecture on the various methods of valuing Annuities and Reversions.

The President stated that a Bill to make Life Policies assignable at Law had been brought into Parliament by Mr. Fagan, and that the Council had appointed a Committee to watch the same.

Third Sessional Meeting, 1848-9. Monday, 26th March, 1849.

Peter Hardy, Esq., Vice-President, in the Chair.

The Vice-President announced that the following works had been presented to the Institute, viz. :—

By Mr. Scratchley,

Analyse et Tableaux de l'influence de la Petite Vèrole sur la Mortalité à chaque age, par E. E. Duvillard. 1806.
Statistique de la Grande-Bretagne et de L'Irlande par De Jonnès. 1837.

By their respective Authors.

Gibbon's Plan of a new Stock or Fund.
Gray on Life Contingencies. 1849.

Mr. G. R. Porter, of the Board of Trade, was unanimously elected an Honorary Member.

The following Candidates, proposed at the last Meeting, were duly elected Associates, viz. :—

William Scott.	Rupert Flindt.
A. M. Logan.	William Swiney.
Theodore Jones.	

The discussion on the address of Mr. Jellicoe, at the last Sessional Meeting, on the various methods of valuing Annuities and Reversions, was resumed and concluded.

Fourth Sessional Meeting, 1848-9. Monday, 30th April, 1849.

The President in the Chair.

The President announced that the following works had been presented to the Institute, viz. :—

Presented by their respective Authors.

Thomson (W. T.) on the Pecuniary Interests of Heirs of Entail. 1849.

Jones (David) on Annuities and Reversionary Payments. 2 vols. 1844.

Mr. Tidd Pratt was unanimously elected an Honorary Member.

The following Candidates, proposed at the last Meeting, were duly elected Associates, viz. :—

George Grant.
Archibald Day.

Mr. Jenkin Jones then read a portion of Mr. Griffith Davies' Paper, entitled an Investigation and Decennial Valuation of the Scotch Schoolmasters' Widows' Fund, calling the attention of the Meeting to several of the Tables.

Mr. Peter Hardy, in the name and at the request of Mr. Thomson, the Actuary of the Standard Life Assurance Company of Scotland, presented to the Institute a large and valuable Table, computed by that gentleman, at the rate of 3 per cent., on the Mortality of the combined experience of the Assurance Offices.

The President then addressed to the Meeting a few observations on the relative amount of Male and Female Population, and the periods of variation in, and equalization of the numbers of, both sexes.

Fifth Sessional Meeting, 1848-9. Monday, 28th May, 1850.

The President in the Chair.

The following Candidates, proposed at the last Sessional Meeting, were elected Associates, viz. :—

J. W. Guild.	T. B. Winser.
George Cutcliffe.	H. W. Porter.
Rev. R. Winter, jun.	

Mr. Thomson explained his Table, presented to the Institute at the last Meeting.

Mr. Jenkin Jones resumed the reading of Mr. Griffith Davies' Paper on the Investigation and Decennial Valuation of the Scotch Schoolmasters' Widows' Fund, and gave extracts.

The President also resumed his observations on the inequality in the rate of Mortality to which the respective sexes are subject, as evinced by the Population Returns.

Sixth Sessional Meeting, 1848-9. Monday, 25th June, 1849.

Peter Hardy, Esq., Vice-President, in the Chair.

The Vice-President announced that the following works had been presented to the Institute:—

	Presented by
Pulling's Law of Mercantile Accounts, 1846 . .	The Author.
Baylis' Arithmetic of Annuities, 1844	do.
Scratchley on Benefit Building Societies, 1849 . .	do.
Miscellaneous Volume on Assurance	G. Grant.
Tracts on the Progress of Science and Literature .	do.
Scottish Acts against Profanity and Immorality .	do.
Huskisson on the Currency, 1811	do.
Mackintosh on the Law of Nature and Nations, 1828	do.
Wilkes' Narrative of the United States' Exploring Expedition, from 1838 to 1842 inclusive . . .	do.
Craik's Reports of Remarkable English Trials, 1840	do.
Duncan's Annuity Tables, 1829	do.
Macnish on the Philosophy of Sleep, 1840 . . .	do.
Ditto. Anatomy of Drunkenness, 1840 .	do.

The Vice-President announced for discussion the question of Medical Fees.

The question of the expediency of remunerating for their Reports, the Medical Referees of Parties whose Lives were proposed for Assurance, was discussed.

Second Session, 1849-50. First Sessional Meeting, Monday, 26th November, 1849.

The President in the Chair.

The President announced that Mr. Jellicoe (Vice President) had presented to the Institute the following works:—

Baily on the Doctrine of Interest and Annuities, 1808.
La Place on the Theory of Probabilities.

It was also announced that the Council had received from Mr. Orchard a paper On the Application of the Theory of Finite Differences to the determination of the Value of an Annuity certain; and from Mr. G. Thomson, a paper on Medical Fees.

At the recommendation of the Council, Mr. Wm. Smith, and Mr. C. J. Bunyon, were elected Fellows of the Institute.

The following Candidates, duly proposed at the last Sessional Meeting, were elected Associates, viz.:—

Tobiah Pepper,
F. C. Norton.

Mr. J. Jones (Hon. Sec.) read a manuscript by Mr. Griffith Davies, On the Methods pursued in valuing the risks of Life Assurance Companies, which led to a renewal of the discussion on Mr. Jellicoe's paper, on the same subject.

Second Sessional Meeting, 1849-50. Tuesday, 8th January, 1850.

The President in the Chair.

The President announced the following contributions to the Library of the Institute:—

	Presented by
Palmer's Computing Scale and Instructions. . .	John Reddish.
Filipowski's Calculating Machine	do.
Smart's Tables of Interest, &c., 1726	do.
Lee on Leases and Annuities, 1738	do.
Population of Ireland, by Newenham, 1805. . .	do.
Brown (Saml.) on Commission, Division of Profits, &c.	The Author.
Farren's Life Contingency Tables.	do.

Sir John William Lubbock, Bart., F.R.S., was unanimously elected an Honorary Member of the Institute.

Mr. G. W. Hearn was unanimously elected a Fellow.

The following Candidates, duly proposed at the last Meeting, were elected Associates:

James Bampton.
Frederick West.
John L. Evans.
John Hooper.
Arthur Pearson.
Edward Cheshire,
Thomas Burr, Jun.
Samuel Lovelock.
W. H. Ashurst.

Mr. Peter Gray read a paper On the value of a Contingent Reversionary Annuity.

Mr. Orchard explained the construction of a Table, by means of which, from any given value of an Annuity, the single and annual premium corresponding thereto, may be found.

Third Sessional Meeting, 1849-50. 28th February, 1850.

The President in the Chair.

The following Candidates, duly proposed at the last Sessional Meeting, were elected Associates:—

W. H. Grey.
W. H. Preston.
H. W. Tucker.
T. R. Hutton.
Henry Noble.
Henry Boyer.
J. P. Scrutton.

The President announced the presentation, by Mr. W. T. Thomson (Vice President), of a copy of his large Students' Table, Carlisle 3 per cent.

It was also announced that Mr. William Wood had presented to the Library a copy of his Conversion Tables; and Mr. W. T. Thomson read a paper explanatory of their construction.

Mr. Pinckard introduced the subject of Medical Fees, pointing out the desirableness of endeavouring to make the Institute available for the purpose of securing an uniformity of practice amongst offices. The President explained that a committee had under consideration a paper on Medical Fees, by Mr. George Thomson, and would report to the Council shortly.

Fourth Sessional Meeting, 1849-50. 25th February, 1850.

The President in the Chair.

The following Candidates, proposed at the last Sessional Meeting, were elected Associates, viz.:—

Joseph Fisher.
G. F. S. Smith.
J. E. C. Koch.

The President announced that Mr. George Grant had presented to the Institute the following works, viz.:—

Maseres on the Doctrine of Chances, 1795.
De Moivre on the Doctrine of Chances, 1718.
The Yearly Bills of Mortality, from 1657 to 1758 inclusive.
Brady's Historical Treatise of Cities and Boroughs, 1704.
Marshall's Digest of Parliamentary Accounts, from 1799 to 1834 inclusive.
Simpson on the Doctrine of Annuities, 2d ed., 1775.

The offer of Three Prizes by Mr. W. T. Thomson for the best observations on his large Students' Table, Carlisle 3 per cent., was notified to the Meeting.

The 1st Prize to be the value of Four Guineas and a copy of the Table.
The 2nd do. do Two do do.
The 3rd do. Copy of the Table.

Mr. Thomson stated the subject as follows:—

For the best observations

As to the principle on which the Table is constructed.
As to its application to Life Assurance, Annuity, and other calculations.
As to the relation in which the D. N. S. and C. M. R. columns stand to the rest of the Table.
As to the effect of Compound Interest as involved in the calculations, comparing the actual payments to be made with the present values as shewn in the Table.

Mr. Jellicoe (Vice President) read a paper On the Valuation of the Risks of Life Assurance Companies, and On the Division of Surplus.

Fifth Sessional Meeting, 1849-50. 25th March, 1850.

Peter Hardy, Esq. (Vice President,) in the Chair.

The following Candidates, duly proposed at the last Sessional Meeting, were elected Associates, viz:—

Henry Ball.
E. T. Jones.
R. J. H. Christie.
Alexander Colvin

Mr. Higham read a paper On the Value of Selection amongst Assured Lives.

Sixth Sessional Meeting, 1849-50. 29th April, 1850.

Charles Jellicoe, Esq. (Vice President,) in the Chair.

Mr. R. J. Lodge, duly proposed at the last Sessional Meeting, was elected an Official Associate.

Mr. Peter Hardy, (Vice President,) read a Paper On General Methods of Approximation.

Seventh Sessional Meeting, 1849-50. Monday, 27th May, 1850.

The President in the Chair.

The following Candidates, duly proposed at the last Sessional Meeting, were elected, viz:—

William Clark, as an Official Associate.

J. L. Oliver,
William White. } As Associates

The President announced the following Contributions to the Library, viz:—

Orchard on Assurance Premiums, by the Author.

By a Friend to the Institute:—

Park on Marine Insurances, 1790.

La Place, Essai Philosophique sur les Probabilitês, 1814.

Stevens on Average, 1817.

Ellis on Fire and Life Assurance and Annuities, 1832.

Haviland's Practical Measurer and Comprehensive Discount Table, 1817.

Lee on Leases and Annuities, 1738.

Marine Insurance, Report of the Select Committee of the House of Commons, with Appendix, 1810.

Hill's Arithmetick, 1761.

Dodson's Calculator, 1747.

Clavis Mathematica Denvo Limata, 1652.

Farren on the Laws of Mortality and Disease, 1829.

Farlane's Calculating Planesphere.

A Report by the Council on Medical Fees was then read to the effect, that, as the question involved a point of practice, and it did not strictly come within the province of the Institute to advise on such matters, the Council did not deem it expedient to recommend any plan for general adoption.

The President then addressed the Meeting on the subject of some New Government Life Tables, which he hoped shortly to lay before the Members.

Mr. P. M. Tait, (an Associate,) read a Paper On the Bookkeeping of Assurance Companies.

Eighth and last Sessional Meeting, 1849-50. Monday, 24th June, 1850.

The President in the Chair.

The President announced that six candidates who had presented themselves for examination were declared to be entitled to certificates of competency, their names in alphabetical order being as follow, viz.:

Mr. Arthur Hutcheson Bailey.
Mr. Archibald Day.
Mr. William Orchard.
Mr. Henry William Porter.
Mr. Philip Scoones.
Mr. John Reynolds Squance.

And that the Council had agreed, under the provisions of Article 6, to recommend for Ballot as Fellows of the Institute, Messrs. Bailey, Orchard, and Porter.

Whereupon a ballot was taken, and Messrs. Bailey, Orchard, and Porter were declared to be duly elected, and were formally admitted by the President, as Fellows of the Institute.

Mr. David Maclagan, duly proposed at the last Sessional Meeting, was elected an Associate.

The following contributions to the Library by Mr. Archibald Day were then announced.

The British Almanack and Companion from 1828 to 1845 inclusive.

Hardy, (James), on Interest and Annuities, 1753.

Jackson on Book-keeping.

Mr. Samuel Brown read a paper On General Methods of Approximation, from original observations, to the values of Annuities and Assurances for long terms of years.

Examination Papers.

Whilst the character and standing of the Actuarial profession are better defined and brought out by the limits which the constitution and laws of the Institute have appointed for it, and whilst it is thus likely to be in future guarded in a great measure from admixture with all "baser matter," it must be evident that the profession will depend for its consideration in time to come not only on the exclusion of ignorance and incompetency, but on the reputation which its members shall acquire for the possession of that knowledge and of those qualities which are calculated to throw a lustre and dignity around it. That the exertions of the present members of the Institute will not be wanting to forward this most devoutly to be wished consummation, there is every reason to believe; certain it is, that of the various means of accomplishing it which present themselves, there is none more important or better adapted to the purpose, than the annual examination, which they have instituted, upon which to found the grant of certificates of competency. It is scarcely too much to say, that upon this test will mainly depend the future position and character of the profession; since the more searching and comprehensive the one shall become, the more powerful and efficient will be the other. Influenced by these considerations, we looked with a good deal of interest for the result of the first attempt of the kind ever made in this particular arena, and when we lay before our readers, (which by the permission of the Institute we are enabled to do,) the papers submitted to the candidates on this occasion, we feel that they will be ready to join in our expression of great satisfaction; not only that six Associates of the Institute voluntarily presented themselves for examination, but that all the six passed through it with great ability and credit to themselves. For it must be remembered that there was little time for preparation and little knowledge of what to prepare for; and under such circumstances the capability of passing through the one ordeal implied the power to grapple with another, of a more widely extended, if not of a severer character. Such being the result of a first experiment, it is apparent that without any injudicious acceleration, we may look in the course of a few years for certificates of competency, granted after examinations which will vie in depth and extent with those of our leading universities, and which shall comprehend not only the knowledge of the mathematician and the statist, but an acquaintance with the principles and action of our own social and political economy, and a familiarity at least with the means of comparing them with those of other nations both ancient and modern.

Examination Paper.—Monday, 10th June, 1850.

No. 1. Show how a decimal quantity can be expressed in the form of a vulgar fraction.

2. Find the fractional value of the recurring decimal ·27272727.

3. Find by logarithms the cube root of a number whose square root is 86·37129.

4. Find the amount of £375, in 50 years, at 5 per cent. per annum, compound interest, and the present value of £500, to be received at the end of 14 years at 3 per cent. per annum, compound interest

5. Solve the general quadratic equation $px^2 - qx + r = o$, and show that the sum of the roots is equal to $\frac{q}{p}$, and their product to $\frac{r}{p}$.

6. Solve the equation $\sqrt[m]{(1+x)^2} - \sqrt[m]{(1-x)^2} = \sqrt[m]{1-x^2}$.

7. Find the sum of the series 1, 3, 6, 10, &c., to n terms (the second differences being supposed constant).

8. Find the sum of n terms of the series $1 + 2x + 3x^2 + 4x^3 +$ &c.

9. Explain what is meant by the logarithm of a number, in respect to a given base, and express algebraically the relation between a number and its logarithm.

10. Explain the use of the Table of proportionate parts in using Tables of logarithms, and give an example of its application.

11. Find the number of permutations which can be effected with n distinct symbols.

12. Prove that the total number of different combinations of n things taken 1, 2, 3, . . . n at a time is $2^n - 1$.

13. State and prove the binomial theorem for the case where the index is a positive integer.

14. A.B.C.D.E., &c. being any series whose fourth differences are zero, express the value of E. in terms of the preceding quantities.

15. The probability of the happening of an event in one trial being $\frac{a'}{a}$, show the respective probabilities of the happening of the same event once only, and once at least in three trials.

16. What is the probability according to De Moivre's hypothesis, that one or the other of three persons aged 20, will be alive at the end of 10 years?

17. Find, on the above-mentioned hypothesis, the present value of £250, to be received in the event of two persons, aged 30 and 50, both being alive at the end of 14 years, money being supposed to double itself in that time.

Examination Paper.—Tuesday, 11th June, 1850.

No. 1. n being the number of years, and i the interest of £1 for one year, give the expression for the amount of £1 in n years at simple interest, also at compound interest, interest being payable half yearly.

2. What is the present value of £1 due 50 years hence, compound interest at 5 per cent. per annum.

3. n and i being as before, what is the expression for the amount of an annuity of £1 at simple interest in n years.

4. Obtain a formula for the present value of £1 per annum, at

compound interest in n years, interest convertible m times in the year, and the annuity payable m' times.

5. What is the value of a perpetuity of £50 per annum at 5 per cent. to be entered upon at the end of 10 years?

6. Explain Barrett's method as modified by Griffith Davis for the construction of Annuity Tables.

7. Obtain expressions by the ordinary methods for the single and annual premiums for a deferred Life Annuity.

8. Obtain the formula for the annual premium for an Annuity of £1 on the Life of A, after the death of the survivor of B and C.

9. Obtain an expression for a single premium for an Assurance for a Life in terms of the annual premium and rate of interest.

10. The premium to assure £100 to be received on the decease of the first of 3 lives, A, B, and C, each aged 20, being £5 10s., what should be the annual premium to assure £250, to be received in the event of A dying, leaving B and C him surviving.

11. Obtain formulæ for computing the value of a Life Policy, first, when the Annuities only are given; secondly, when the premiums and rate of interest only are known.

12. Enumerate the Tables of Mortality most in use, and state briefly their respective merits and defects.

13. What are the principal methods employed in the formation of Life Premium Tables?

14. Enumerate some of the more important questions connected with Life contingencies, in which a ready solution is afforded by the Columnar Method.

15. Describe shortly the process of valuation in a Life Office, on a first division of profits.

16. How would you ascertain the value of a Life interest, proposed as an investment certain?

17. Having such an investment comprised in the assets of a Company, how would you treat it in the valuation of such assets?

18. Give a brief description of the method of double entry, and shew how the books of a Company kept upon such method, may be made to furnish a complete account of the state of its affairs.

We have received from the the pen of a valued correspondent, which has already been skilfully employed on subjects both scientific and practical of the greatest importance in Life Assurance, an article of so useful a character, as showing the advances which have lately been made towards an union of the hitherto divergent interests of the profession of Actuaries, that we should be wanting to one of the principal objects of this publication, if we failed to give it insertion, though somewhat too late for the proper position which it ought to occupy. It may very fitly, however, take the place of a report (which we do not insert, since it has appeared already in the public journals) of the hospitable reception with which the representatives of the English Actuaries have lately been honoured by their Scottish brethren at Edinburgh and Glasgow. It is a visit, which, we hope, will lead to that cordial interchange of good offices and kindly feeling so much to be desired in the profession, and for which the managers of the Scotch offices have been so long and so eminently distinguished.

Mental Statistics, or Edinburgh in 1850.

Cautious as we should be, and cautious as we in England really are in admitting metaphysics within the pale of the exact sciences, we cannot withhold from the statistician the progressional use of such results as have actually come within his own cognizance, and it is in this sense, and in this sense only, that we have thought it well to direct the attention of the reader to an illustration from what we have ventured to term "mental statistics." The general reader may be already aware that the British Association for the Advancement of Science, represents a voluntary effort on the part of the most eminent men from all parts of the kingdom, and of all shades of opinion, to co-operate for the purposes of science. But he may be ignorant of the fact or have forgotten it, that this association has now endured twenty years, and that after having located at Edinburgh sixteen years ago, and intermediately annually at different places, has recently held its meetings at the same city. The reappearance, therefore, of the Association in Edinburgh after the lapse of 16 years, forms a species of cycle, and upon instituting the necessary inquiries among those who were present at the former and at the recent meeting, the conclusion results, that minds, however dissimilar in other respects, can from year to year successfully co-operate in one common scientific object, and that the progress of "mental statistics" is really more towards producing uniformity of opinion by keeping within the parallels of mutual appreciation and mutual forbearance, than towards the production of vagaries generated by heedless attempts to gratify self-importance merely by differing from having the opportunity of differing from others. But it may be said of this experience, as illustrated at Edinburgh at two periods, 16 years apart, that the British Association, by being composed of members of different professions and pursuits, rendered this co-operation the more facile, and the "statistics" did not include those professional jealousies that members of the same calling might be presumed to exhibit. The illustration we offer in refutation of this standard decryal of professional associations, is one that cannot fail to be interesting to the reader of the *Assurance Magazine*, for at or about the time the British Association visited Edinburgh 16 years ago, was formed an association of the Managers of the Assurance Societies in Scotland; about three years ago this association was quoted and acted on as evidence of the feasibility of establishing the Institute of Actuaries of Great Britain and Ireland; about three months ago, the Institute received an invitation to a banquet from the Scottish Section of Managers, in honour of their London colleagues; and about three weeks ago, this invitation was personally responded to by J. Finlaison, Esq., as representing the President of the Institute, by Messrs. Hardy and Jellicoe, as representing the Vice-Presidents, by Mr. R. Tucker, as representing the Secretaries, and by Messrs. Brown, Farren, Lodge, Neison, Ratray, and Williams, as representing the general Council and body of members. When it is considered how difficult it must have been to arrange their absences from London, and that these gentlemen, in undertaking to form a deputation in travelling from London to Edinburgh, could have had no other object than to exemplify the anxiety that is felt in England, that the general body of Actuaries throughout the kingdom should become a compact and efficient profession, actuated by the same general principles, and only deviating in such details as are almost essential for the preservation of the individuality of places and persons, we trust that our readers will share the pleasure, in perusing, that we feel in recording, that the banquet, including about 130 persons, more or less engaged in Assurance matters, passed off in the most friendly and in the most satisfactory manner. The hospitality of Scotland has long been proverbial, and never was it confided for better illustration than it was recently in the hands of Messrs. Finlay and Thomson, as Scottish representatives of the Council of the Institute, and their colleagues of the Managers' Association, Messrs. Balfour, Borthwick, Chalmers, Christie, Dickie, Fraser, Griffith, Ivory, Ramsey, Smith, Spens, Walkinshaw, and Watson. The Institute of Actuaries, therefore, may be fairly said to have represented by its delegates from London and its numerous representatives in Scotland as true an example from "Mental Statistics" of the subsidence of individualities into general principles in the department of Life Assurance, as the more general assembly of the British Association in the same city, and at the same time, may be said to have been typical of the same qualities among the lovers of science in general. It is difficult to judge of the oak from the acorn, and premature to assume that resolve is always sustained by resolution, but it will certainly be a bright page in the history of the subject when it has to be recorded that the early labours of Halley. De Moivre, Simpson, Price, Morgan, Baily, and Milne, have been the means of adding an honourable profession to those previously existing, and that the Institute of Actuaries, by acting harmoniously together, have been the agents by which so desirable an object has been publicly recognized and consummated.

E. J. F.

THE formation of the Institute of Actuaries has, no doubt, tended, in a great degree, to afford the profession and the public the kind of protection which, in all the relations existing between them, both have stood so much in need of. The mere enrolment of the names of its members will, in future, serve to indicate at least a large portion of the profession; whilst the existence of such an organised body will, it is probable, prevent unskilled and incompetent persons assuming a name and functions to which neither their education nor acquirements give them any sufficient title. But more is still required! That the Institute will soon aggregate all the existing members of the profession, and that it will hereafter send forth a new race of even more competent men than have heretofore entered upon the field, there is little room to doubt. But then the permanence of the Institute itself must be secured; in like manner the probability of the intrusion of unfit persons into the profession is less than heretofore,—but such intrusion must be absolutely prevented,—and these objects, it is obvious, can only be attained by the aid and sanction of the legislature. After a good deal of careful consideration, we have, with the kind assistance of legal friends, endeavoured to lay down the general outlines of a Bill which, as it appears to us, would be calculated, if passed into a law, to accomplish the objects in view; and we submit it accordingly to the members of the profession, hoping that they may be induced to give their attention to its details, and should they be approved, their help towards its completion. It will be seen that the Bill provides, in the first place, for the enrolment, without expense, of the names of all the approved members of the profession, whether of the Institute or not. It then proceeds to effect the incorporation of the Institute, and embodies its *present* laws and constitution. The creation and registration of future members, and the terms of their admission to practice, is then provided for. The infliction and recovery of penalties for improper assumption of an Actuary's functions, occupy a few clauses, and the document concludes with an explanation or definition hitherto so much wanted, of the precise nature and character of those functions.

Many objections will possibly be found to the Bill, as it now stands —nor is it pretended that amendments may not be required. It is put forward as the ground-work at least of what such an enactment should be, and any hints for rendering it of greater efficacy, or for its general improvement, will be gladly received.

A Bill for regulating the Profession and Practice of Actuaries throughout Great Britain and Ireland.

Preamble.

Whereas among all classes of people in this realm, very many persons have procured their own lives and the lives of others to be assured or been guaranteed in respect to fidelity of trust, by certain bodies corporate and companies, and many and great reversionary and other interests and annuities have been valued and purchased and annuities and large sums of money contracted to be paid, by such bodies corporate and companies, and important family settlements, and aggregate and individual interests are involved in or affected by many of the transactions aforesaid: And whereas such transactions are daily increasing and are likely to increase more and more, and it is therefore highly necessary for the due and effectual protection of the public, that the scientific principles, doctrines, methods, calculations and rules, upon which all such transactions shall be hereafter undertaken and founded, should be ascertained, made and carried through by such skilful, experienced, and competent persons only as are hereinafter authorised in that behalf: And whereas the several persons whose names are next hereinafter set forth, being respectively Actuaries of Great Britain and Ireland, and persons otherwise more or less connected with or intending hereafter to pursue, the practice and profession of Actuaries, have formed themselves into an association, under the title of "the Institute of Actuaries of Great Britain and Ireland," that is to say, namely,* [*here set forth the names intended, and*

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* Say, every member, (however denominated,) of the Institute.

the offices, or other personal description or address as may be.] and have adopted for the constitution and good government thereof, certain laws, rules and regulations: And whereas, in order to insure such due and effectual protection to the public, by securing the acting upon safe scientific principles, doctrines, methods, calculations and rules as aforesaid, in all such transactions as aforesaid, it is expedient to make the provisions hereinafter enacted, and for the more convenient execution of such provisions, to give the sanction of parliament to such association and Institute of Actuaries, and to the constitution, laws, rules and regulations for the same, which are hereinafter set forth: Be it therefore enacted by the Queen's Most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal and Commons, in this present Parliament assembled, and by the authority of the same, That the several persons whose names are next hereinafter expressed, being severally and respectively at the time of the passing of this Act, Actuaries of Great Britain and Ireland* [*here name all existing Actuaries, with their offices, or other description or address.*] shall severally and respectively, now and henceforth, be and be deemed qualified to practice the profession of an Actuary, without the previous examination, certificate of competency, admission and payment hereinafter required; subject nevertheless, to be registered at the time and in the manner hereinafter directed on the register of Actuaries hereinafter required to be made and kept; and no person whosoever, other than those secondly hereinbefore named and specified, shall be, or be deemed at the time of the passing of this Act, an Actuary at such time, or be capable of practising as such in any manner whatsoever.

Existing Actuaries specified and authorised to practise without examination, certificate and admission; subject to registration.

After passing of this Act, no person, except those secondly before named, to practise as an Actuary, without examination, &c.

II. And be it enacted, That from and after the passing of this Act, no person whosoever, other than those Actuaries secondly hereinbefore named and specified, shall be, or shall practise as an Actuary for gain, hire, salary or reward, without the previous examination, certificate of competency, admission, payment and registration hereinafter required.

Association called "Institute of Actuaries" &c. declared a body corporate.

III. And whereas for the execution and furtherance of the purposes of examination, granting certificates of competency, admission and registration, and the other objects of public utility contemplated by this Act, the before mentioned Association, called "the Institute of Actuaries of Great Britain and Ireland," may be fitly employed as a ready and efficient instrument, if legally incorporated and otherwise duly empowered by Act of Parliament in such behalf: Be it enacted, that from and after the passing of this Act, the several persons, (being also duly registered as herein after required,) whose names are first hereinbefore set forth, the Members of the said Association and Institute at the time of the passing of this Act, and also the several persons being so registered, who shall be hereafter admitted members of the said Association and Institute, incorporated by this Act, shall but so long only as they shall continue members thereof, according to the Constitution, Laws, Rules and Regulations thereof, be and they are hereby constituted, one body politic and corporate, by the name of "The Incorporated Institute of Actuaries and their Associates of Great Britain and Ireland," for the purposes for which the said Associate and Institute has been formed and the other purposes expressed in this Act, and shall by the same name have perpetual succession, and shall have a common seal, with power to alter and renew the same at their discretion, and shall by the same name sue and be sued, implead and be impleaded, and answer and be answered unto, in every court of Law and Equity in Great Britain and Ireland; and shall be capable in law to take purchase and hold to them and their successors, any goods, chattels, and personal property whatever, and shall also be capable in law, notwithstanding the statutes of mortmain, to take purchase and hold such lands, buildings, tenements, and hereditaments, as may be necessary for the purpose of such Incorporated Institute, with power to demise, alien, and dispose of all or any of such lands, buildings, tenements, and hereditaments, goods, chattels, and personal property, and to do all other acts and things incidental to a body corporate.

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* Say, to include all Actuaries and persons certified and admitted by the Institute before the passing of the Act.

Objects, Constitution, &c. of the Incorporated Institute.

IV. And be it further enacted, That from and after the passing of this Act, the Objects and Constitution, Laws, Rules and Regulations of the said Incorporated Institute, are hereby declared and required to be as follows:—that is to say; [*These will be as nearly as possible the Laws, &c. of the Institute at the time of the passing of the Act.*]

One examination to be passed before 1st Jan., 1854, and after 1st Jan. 1854, no person to be admitted as an actuary who shall not have been an associate three years in the Incorporated Institute before application, and been examined in each of such years.

V. And be it enacted, That from and after the passing of this Act, and before the first day of January, 1854, (except the persons secondly hereinbefore expressly named,) no person shall be at liberty to practise as an Actuary who shall not be an associate of the said Incorporated Institute and have undergone one examination at least in the manner provided by this Act, and received the certificate of competency and the admission, and made the payment respectively prescribed by this Act; and on and after the first day of January, 1854, it shall not be lawful for the said Incorporated Institute to admit as such, any person applying to be admitted as an Actuary, who shall not have been an associate in such Incorporated Institute for three years next preceding the date of such application; and who shall not in each of such years have undergone a progressive examination in the respective departments of scientific knowledge before-mentioned by the examiners of the said Incorporated Institute: Provided always, that if any such applicant shall before the first day of January, 1854, have undergone any one such examination, or any two such examinations, and been an associate of the said Incorporated Institute any time between the passing of this Act, and the said first day of January, 1854, every such examination and such membership shall be reckoned as if they had respectively occurred after the said first day of January, 1854, and as a portion of the said three years.

Proviso for any examination and membership had before the year 1854.

Examiners to be appointed for the examination of candidates in Scotland and Ireland, and to report to the Council.

On Report of Examiners, Council to give admission on parchment under seal.

VI. And be it enacted, That as soon as possible after the passing of this Act, the council of the said Incorporated Institute, shall appoint a sufficient number of examiners resident in Scotland and Ireland respectively, for examining such candidates for admission as shall be there resident respectively, and it shall be lawful for such examiners and they are hereby required duly to examine in the manner provided by this Act all such candidates accordingly and (if approved) to grant them certificates of competency accordingly, and report thereon to the council; and after the report of the competency of any candidate by the examiners in England, Scotland, or Ireland, and on production of his certificate and a request to be admitted as an Actuary and a tender of payment of the sum of ten pounds and ten shillings, hereafter made payable by this Act, the said council shall forthwith prepare and give to every such applicant an admission on parchment in the following form of words (or in words to the like effect) and sealed with the seal of the said Incorporated Institute, that is to say:—

"The Incorporated Institute of Actuaries and their associates of Great Britain and Ireland.

"At a meeting of the council of the said Incorporated Institute, held on the day of , one thousand eight hundred and fifty , at in the City of London,
of , in the County of , gentleman, having applied to be admitted an Actuary, and presented his certificate of competency signed by the examiners, and the report of the said examiners having been read, is hereby admitted an Actuary of Great Britain and Ireland in pursuance of the statute in such case made and provided and the laws, rules and regulations of the said Incorporated Institute. Sealed with the seal of the said Incorporated Institute. L.S."

Additional examination may be had, where candidate not competent at the examinations required by the Act.

VII. And be it enacted, That if the examiners shall at any one or other of the annual examinations find any candidate to be incompetent, and thereupon refuse a certificate to such candidate; the said examiners shall, on request of such candidate, fix a time for a further examination, and so on till the candidate, if he persist, shall be declared competent; and for every such additional examination beyond the three annual ones required by this Act, the candidate requiring the same shall be subject to and make to the examiners before any such additional examination payment of the sum of five pounds five shillings in addition to the sum of ten pounds and ten shillings, hereinafter made payable by this Act on receiving his admission.

Actuaries made liable to a payment of £10 10s. on admission.

VIII. And be it enacted, That from and after the passing of this Act, every person admitted as an Actuary as hereinbefore required, shall on receiving his said admission and before he shall practise as such Actuary, pay the sum of ten pounds and ten shillings to the council of the said Incorporated Institute or its officer duly authorised by it to receive the same; and the receipt for the same under the seal of the said Incorporated Institute shall be sufficient proof in all courts of law and equity that such payment has been duly made.

The existing Council and officers of Institute may in the interval between the passing of the Act and the first General Meeting act respectively without re-election.

IX. And be it enacted, That in and during the interval between the passing of this Act and the first general meeting of the said Incorporated Institute in 1852, and no longer, the said Incorporated Institute shall and may act and continue to act by, under, and through the council and officers thereof existing and acting at the time of the passing of this Act, and shall and may in and during such interval fill up vacancies in any such offices that may occur, as before the passing of this Act; but in all other respects (where practicable) the said Incorporated Institute shall act and be deemed to be acting in and during such interval under the provisions of this Act.

Admission fees to be applied in payment of expenses incurred under the Act.

X. And be it enacted, That all the said payments so to be made to the said Incorporated Institute by persons examined, certified and admitted as Actuaries under this Act, shall by such Incorporated Institute be applied in defraying the costs and expenses of the registrar and registration hereinafter mentioned and required, and any costs and expenses arising out of such examination of candidates and granting certificates of competency and the admissions required by this Act, and for the other general purposes (if any) arising out of this Act; and the surplus (if any) shall go to the general fund of the Incorporated Institute.

Register of Actuaries to be made and kept, and List to be laid before every General Meeting.

XI. And be it enacted, That the Registrar for the time being of the said Incorporated Institute shall, in addition to his other duties, on the day of the passing of this Act, enter in a book the names, in alphabetical order, and places of abode of all the Actuaries of Great Britain and Ireland, secondly in this Act hereinbefore expressly named, and thereafter the names in like order, and the places of abode of all such persons as shall be at any time after the passing of this Act, admitted Actuaries of Great Britain and Ireland under this Act, with the names (in both cases) of the Body Corporate or Company (if any) of which each shall be the managing officer, the situation and locality of the office of such Body Corporate or Company, and where any such Actuary shall have been admitted after the passing of this Act, the date of such his admission; and such book shall be, and be called "The Register of Actuaries of Great Britain and Ireland;" and the Registrar for the time being shall prepare in every year, an alphabetical list therefrom of all the Actuaries then on the said register, and lay the same before every Annual General Meeting of the said Incorporated Institute in every year; and such register shall be deemed the Register of Actuaries empowered to practise by virtue of this Act, at the time of holding any such General Meeting; and every such alphabetical list or a copy thereof shall be affixed, and kept affixed in the room of meeting of the members of the said Incorporated Institute; and no person whose name shall not be on the said Register, shall be qualified to practise as an Actuary, so long as his name shall not stand in the said Register: Provided always, that it shall be lawful for the said

Proviso for insertion of names omitted.

Registrar at any time after the General Meeting before which the said alphabetical list shall have been laid in any year, to insert in the said book and list, or either, the name of any Actuary, which shall have been omitted therefrom, and signify the same specially to the ensuing General Meeting: Provided also, that the name of no Actuary, after having been once so registered, shall be omitted or removed from the said Register, except in the event of his decease; but his name shall be continued from year to year on the Register; the Actuaries (if any) admitted between each General Meeting, and those (if any) whose names have been omitted in any previous year as aforesaid, being only added thereto in each year: Provided also, that the said Registrar shall be bound to take official notice of the admission of every person as an Actuary, and shall immediately, upon the admission of any such person insert his name in the said Register.

Proviso for continuing name on Register when once placed thereon.

Proviso, that Registrar take official notice of persons admited.

XII. And be it enacted, That from and after the passing of this Act, if any person, not having been duly registered, as hereinbefore required, except any Actuary whose name shall have been accidentally omitted by the Registrar, shall practise as an Actuary for gain, hire, salary, or reward; or if any person (except the persons herein-before named and authorised in that behalf) shall so practise as an Actuary, any such person not having first undergone the examination, and obtained the certificate of competency and admission, and having made the payment or payments required by this act, or without having obtained such certificate or admission after examination, or made any such payment or either of them; or if any Actuary shall knowingly permit any person not an Actuary so to practise in his name for gain, hire, salary, or reward; every person so offending shall for every such act of omission or permission forfeit Twenty Pounds, with all costs of suit: Provided always, that nothing in this Act shall be construed to prevent any salaried or paid clerk or subordinate officer not admitted as required by this Act, of any Body Corporate or Company, or any paid person not so admitted, from making the calculations, estimates, or valuations, which it is the business of an Actuary to make, as hereinafter defined and declared; so long as the same shall be made under the direction and by the authority of the Actuary of such Body Corporate or Company, or of an Actuary generally, in aid of such Body Corporate or Company, or of such Actuary only, and not for third persons.

Persons practising without Registration, or without examination and certificate, and admission and payment of the fee, or either, or actuaries permitting others to practise in their names, to forfeit Twenty Pounds for every act, omission, or permission.

Proviso for salaried and paid persons acting under actuaries.

XIII. And be it enacted, that from and after the passing of this Act, the common seal of the said Incorporated Institute shall be deemed to be, and shall be received in every Court of Law and Equity in Great Britain and Ireland as sufficient proof of the admission of any candidate, or of any instrument whatever to which the same shall be affixed, and that the person named in such admission is qualified to practise as an Actuary.

Seal of Incorporated Institute to be sufficient evidence of authenticity of instrument

Recovery and Application of Penalties.

XIV. And be it enacted, That the Penalty of Twenty Pounds hereinbefore imposed, shall be recoverable at the suit of the said Incorporated Institute in England and Wales, in any County Court in Middlesex, or any Court for the recovery of debts of that amount in the City of London, or in any County Court or other Court where the defendant shall reside at the time of commencing the suit for the same; and in Scotland and Ireland, in any Court for the recovery of debts of that amount in and for the City of Edinburgh or Dublin respectively, or in and for the district where the defendant shall live at the time of commencing the suit for the same; and the said penalty, if and when recovered, and all costs of suit, shall be adjudged to be paid to the said Incorporated Institute, and shall form a portion of the funds of the same and be disposable as shall be thought fit by the Council thereof.

Interpretation of words.

XV. And be it enacted, That the words "Actuary" and "the Profession and Practice of Actuaries," in this Act, are hereby defined and declared to mean, and in the construction of this Act, shall mean respectively as follows, every person making or causing to be made, for gain, hire, salary or reward, any calculation based upon the theories of the interest of money, or the theories of probability, or upon the two theories combined; or making for gain, hire, salary or reward, any estimate or valuation of risks, assured, guaranteed or otherwise provided against by any Body Corporate or Company, and secured by payments calculated in accordance with such theories; and the words, "Body Corporate and Company," when and wheresoever used in this Act, shall, in the construction thereof, mean and include, every Body Corporate, Corporation, Company, Association, Society, Institute, Institution, Office, or Body of persons associated for all or any of the purposes following, that is to say, for the purpose of undertaking the assurance of lives against any contingency whatsoever, or of purchasing annuities, reversionary interests or interests of any kind deferred or otherwise, or of granting annuities or any sums of money payable forthwith, or at any deferred period; or of guaranteeing fidelity of trust in persons trusted or employed by others,

Act to be deemed a public Act.

XVI. And be it enacted, That this Act shall be deemed and taken to be a public Act, and shall be judicially taken notice of as such by all judges, justices, officers, and others, without being specially pleaded.

Act may be altered or repealed in this Session.

XVII. And be it enacted, That this Act may be amended or repealed by any Act to be passed in this Session of Parliament.

THE

ASSURANCE MAGAZINE.

On the Values of Annuities, which are to pay certain given Rates of Interest on the Purchase Money during the whole term of their continuance, and to replace their Original Values, on their expiration, at certain other *given Rates.* By PETER HARDY, F.R.S., one of the Vice-Presidents of the Institute of Actuaries of Great Britain and Ireland, and Actuary to the London Assurance Corporation.

(*Read before the Institute of Actuaries, 25th November*, 1850.)

NOTWITHSTANDING the very large amount of leasehold property, which in the course of every year is bought and sold in this country, and notwithstanding the extensive transactions—of almost hourly occurrence—in the public market, in Government and other temporary Annuities, the subject of the rate of interest which any given purchase will yield the buyer is very imperfectly understood, even by those most deeply interested in the inquiry, unless they happen to be at the same time well versed in actuarial computations.

It is not unfrequently imagined by a buyer, that if he purchase a leasehold property or a temporary Annuity at a price corresponding with the value of an Annuity at a given rate of interest, (say 5 per cent.,) that he has made a purchase which will pay him 5 per cent., or which, in other words, will enable him to spend 5 per cent. per annum on his outlay, and at the same time replace his capital undiminished at the expiration of the term.

This is a grave error, and very frequently leads to serious inconvenience. If a purchaser buy an Annuity for a term of years according to a 5 per cent. Table, it is absolutely essential that the surplus of the Annuity over and above the interest on the purchase money should be annually re-invested in some fund which will also yield a clear 5 per cent., otherwise the buyer's expectation of replacing his capital at the expiration of the term will not be realized.

This is invariably so, whenever the term for which the Annuity is granted exceeds a single year; in which case only, as Annuities are supposed (unless otherwise expressed) to be payable at the expiration of each year, the surplus of a single year's Annuity remaining after deducting the interest for a year, will be sufficient to replace the capital originally expended in the purchase. For instance, suppose an Annuity of £10,000 for one year to be purchased, according to a 5 per cent. valuation,

The cost will be	£9,523	16	0
At the end of the year there will be due for interest at 5 per cent. on this sum	476	4	0
Making a Total of	£10,000	0	0
Which will be exactly met by the Annuity to be then received	£10,000	0	0

But an Annuity of a similar amount purchased for two years will not exhibit the same equation.

An Annuity of £10,000 for two years, purchased according to a 5 per cent. valuation, will cost about £18,594.

At the expiration of the first year the purchaser will receive one instalment	£10,000	0	0
Out of which he will take, as one year's interest on his capital laid out, £18,594	929	14	0
Leaving surplus Annuity to be put aside as a portion of the capital repaid	£9,070	6	0

To make this example an extreme case, we will assume that no interest is made of this sum, that no investment of it is attempted, but that it is merely placed, for the sake of custody, until the completion of the transaction, in a banker's hands,

At the end of the second year the purchaser will receive the second and final instalment of his Annuity	£10,000	0	0
Out of which he again takes another year's interest on his £18,594 originally laid out	929	14	0
Leaving as before a second sum of	9,070	6	0
Which being added to the former balance	9,070	6	0
Makes a Total capital of	£18,140	12	0
Which does not replace by	453	8	3
The capital originally expended	£18,594	0	0

The deficiency is manifestly the exact amount of one year's interest at 5 per cent. on the first balance of the Annuity (£9,070 6s.) permitted to remain for one year unproductive in the banker's custody.

From an examination of the forgoing example, two considerations obviously suggest themselves, viz.—1. That the instalments of repaid capital—or surplus Annuity, as they may more properly be termed—must be re-invested as they are received; and, 2. That they must be made to yield exactly the same annual rate of interest, as that produced by the original investment.

The purchase, therefore, of a temporary Annuity according to a 5 per cent. valuation merely implies, that an interest of 5 per cent. is annually realized on those portions of the original purchase money which remain from time to time in the investment.

It is, however, obvious that the value of an Annuity certain for a term of years, may be so calculated as to admit of the purchaser making 5 per cent., or indeed at his option any other given rate of interest, on his outlay, during the entire term of the Annuity, and yet enable him to replace that outlay at the expiration of the term, by the accumulation of the annual surplus of the Annuity at some lower rate, say 4 or 3 per cent.

It would, moreover, seem highly desirable that a set of Tables should be calculated on this basis, to enable temporary Annuities and leasehold properties to be purchased in accordance with these views. It is nearly a quarter of a century since Mr. Griffith Davies, in his Tables for Life Contingencies, published in 1825, gave—I imagine for the first time—a Table showing the value of an Annuity on a single life which was to pay the purchaser 5, 6, or 7 per cent. on his outlay, and to replace the original capital at 3 per cent., that is to say, according to the 3 per cent. Northampton rates. With, I believe, the single exception of Mr. Benwell,* who wrote in the year 1831 a few pages on this subject, it does not appear to have occurred to any of the actuaries who have from time to time been in the habit of employing that very useful Table, that the principle on which it was computed was equally applicable to Annuities certain until so lately as the year 1849, when it was shown by Mr. Jellicoe, one of the Vice-Presidents of the Institute of Actuaries, in a Lecture which he delivered before the Members of that body, "that in the cases of temporary Annuities certain the present values "as given by the Tables were not adapted to practical purposes, "inasmuch as in order to reproduce the capital at the end of the term "the necessity arose of improving the portions of it returned from "year to year, at the rate of interest proposed to be made in the "interval."†

The idea of constructing a set of Tables in conformity with the foregoing views, was suggested to me some two or three years ago by Mr. William Drummond, solicitor, of Croydon. My want of leisure for the inquiry did not, however, admit of my immediately working out Mr. Jellicoe's hint or following up Mr. Drummond's suggestions, and I have from time to time deferred my proposed investigation of the subject. With the assistance, however, of my friend Mr. Edgar Sharpe, A.I.A., of the London Assurance Corporation, I have prepared a small set of Tables, which will be found, I think, useful, as embracing those rates and terms most likely to present themselves in practice; and I now submit these Tables, together with the accompanying remarks and investigations, to the Institute of Actuaries. The following is an algebraical investigation of the question:—

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* It is, however, due to Mr. Benwell to state, that his work above referred to distinctly treats the subjects now under consideration, but in a style so little happy, and so involved, that the merit of the actuary is apt to be overlooked in the obscurity of the writer. Mr. Benwell, moreover, computed some tables of a character similar to those appended to this Paper; two of the columns in Table of his little work are identical with Value columns 7 and 11 in the accompanying table; which table was, however, independently calculated, indeed, I never saw Mr. Benwell's book until the present Paper had been written for some weeks, and was actually in type.

† See an account of this Lecture in the Post Magazine for 10th March, 1849.

PROBLEM,

To determine the present value of an Annuity certain of £1 per annum for n years, which is to pay, during its continuance, a given rate of interest on the original purchase money, and to replace that purchase money at the expiration of the term at a different rate of interest.

SOLUTION.

The annual payments of the Annuity being each $=$ £1, let $i' =$ the rate of interest which the purchaser intends to make on each £1 of his investment, or, as it may be termed, the *remunerative rate*. Let $(r-1) =$ the rate of interest at which the purchaser expects to accumulate the surplus Annuity, in order to replace the original capital, or, as it may be termed, *the accumulative rate*. Let $\frac{r^n-1}{r-1} =$ the amount of an Annuity of £ 1 per ann. for n years forborne and accumulated at $(r-1)$ rate of interest (*see* Author's Doctrine of Interest Simple and Compound, 1839. Prob. II. Sec. II.) and put $V =$ the required value.

Now it is obvious that

$Vi' =$ the purchaser's annual interest;

$1 - Vi' =$ the surplus Annuity to be accumulated, so that in n years it may reproduce V.

If £1 per ann. in n years will accumulate into $\frac{r^n-1}{r-1}$, then

$V = (1 - Vi')\frac{r^n-1}{r-1}$; and if, for the sake of simplicity, we represent $\frac{r^n-1}{r-1}$ by a single symbol, say $\mathfrak{A}$, we shall have

$$V = (1 - Vi')\,\mathfrak{A}$$

$$V = \mathfrak{A} - Vi'\,\mathfrak{A}$$

$$V + Vi'\mathfrak{A} = \mathfrak{A}$$

$$V\,(1 + i'\mathfrak{A}) = \mathfrak{A}$$

$$V = \frac{\mathfrak{A}}{1 + i'\mathfrak{A}}$$

The correctness of this solution may be readily ascertained, because it is manifest from what has been previously said, viz. that in order to realize the rate of interest at which the valuation was made, it is necessary that the surplus Annuity should be invested in, or accumulate at, the same rate of interest, so that if the accumulative rate in the above equations be made equal to the remunerative rate, that is, if $i' = (r-1)$, then V, the final value produced, should be equal to the ordinary value of an Annuity for n years at $(r-1)$ rate of interest, that is to say,

$$V = \frac{\mathfrak{A}}{1 + i'\mathfrak{A}} = \frac{\frac{r^n-1}{r-1}}{1 + (r-1) \times \frac{r^n-1}{r-1}} \qquad \therefore V = \frac{r^n-1}{r-1} \times \frac{1}{r^n}$$

which is the expression for the value required. (*See* Author's Doctrine of Interest. Prob. V. Sec. II.)

The equation $V=(1-Vi')\mathfrak{A}$, naturally suggests a very simple method of solving the Problem, previously referred to, on which Mr. Griffith Davies has founded his Table showing the value of an Annuity on a Single Life, allowing a given rate of interest and the premium for assurance.

It is to be borne in mind that every annual premium (p) payable during the existence of a given life, for an assurance of £1 on death, is an annual sum which (on an average of cases) will provide, or in other words accumulate into, the sum assured on the extinction of the life in question.

Now Mr. Davies' Table is so constructed, that the value given for the Annuity is to be reproduced by the assurance on the extinction of the life; and as the purchaser is to have his interest on this value out of every £1 received as Annuity, it is obvious that the premium which reproduces the value or the assurance, is the difference between the said interest and £1, in like manner as the difference between £1 and Vi, in the above equation, reproduces V by accumulation, but there is a difference in the conditions under which the Annuity certain is reproduced at the expiration of the term, and those under which the sum assured is reproduced on the extinction of the life. V in the first case not only represents the original outlay, but also represents the sum to be ultimately reproduced; but in the case of a Life Annuity, V does not represent the original outlay, inasmuch as the premium (p) being made payable at the commencement of each year, the outlay V must be increased by the first premium expended: neither does V, increased by the amount of this premium, represent the sum which is to be insured or reproduced, because one year's interest on both V and the first payment of the premium must be secured by the assurance, inasmuch as from the nature of a Life Annuity, which is made payable at the end only of each year, to the termination of which the annuitant survives, no Annuity is received for the year in which the life drops, consequently in that year the purchaser would lose both premium and interest, were it not secured to him by the assurance. We have, however, seen that £1 = both premium and interest, and therefore $V+1=$ the amount to be assured; and since $V+1=$ the sum to be assured, $p\,(V+1)=$ the premium actually expended, as an original outlay in the first year, and as the surplus of the Annuity in all subsequent years, therefore the original outlay $=V+p\,(V+1)$, and the purchaser's interest thereon $=Vi'+pi'\,(V+1)$; and since as $p:1::1:\frac{1}{p}$, we shall have instead of

$$V=(1-Vi')\,\mathfrak{A}$$

the corresponding equation

$$V+1=(1-Vi'-pi'\,\overline{V+1})\,\frac{1}{p}$$

$$V\left(\frac{p+pi'+i'}{p}\right)=\frac{1-p-pi'}{p}$$

$$V=\frac{1-p\,(1+i')}{p\,(1+i')+i'}$$

which will be found to correspond with the solution given by Mr. David Jones in his work on Annuities, &c., Vol. I. p. 190, and to be equivalent to the more simple and far more elegant expression given by Mr. Davies for the solution of the same problem in his unpublished work, Chap. IV. pp. 250, 251, viz. :—

$$V = \frac{1}{d+p} - 1, \text{ where } d = \frac{r-1}{r}$$

It is apparent, on a little consideration, that the foregoing problem is in some measure complicated by the circumstance that the value of the Annuity and the sum to be assured both differ from the sum actually expended by the purchaser.

For instance, the value of the Annuity is V,
The sum to be assured is V + 1,
The sum expended is $V + p.(V + 1)$.

The necessity for these differences, as I have already pointed out, arises from premiums being made payable in advance at the beginning of each year, and also from the circumstance of Annuities being *not payable* for the year in which the annuitant dies.

If an Annuity, however, in addition to being payable at the end of each year, if the annuitant be alive, were also to be made payable at the end of the year in which he died, that is, if the Annuity were to be made *payable for the year of death;* and further, if the annual premium were to be made payable at the end instead of at the commencement of each year and *also for the year of death*, in such case it is evident that V will equally represent the value of the Annuity, the sum actually expended, and the amount to be assured, and the problem would then become quite as simple in its form as that of an Annuity certain. For example, the value of an ordinary Annuity on a single life aged A years will be represented in my Notation (1840) by I_{A}, and the value of a reversion of £1 payable on the extinction of the same life by the symbol ${}^{\mathrm{A}}\mathrm{I}\mathring{\mathrm{i}}$. Now it is obvious that the value of an Annuity which is made payable for the year of death is $\mathrm{I}_{\mathrm{A}} + {\scriptstyle\mathrm{A}}\mathrm{I}\mathring{\mathrm{i}}$. That is to say the value of the ordinary Annuity is increased by the value of £1 payable at the end of the year in which A dies, and since $\mathrm{I}_{\mathrm{A}} + {\scriptstyle\mathrm{A}}\mathrm{I}\mathring{\mathrm{i}} = \dfrac{\mathrm{I}_{\mathrm{A}} + 1}{r}$ the annual premium (ϕ) payable *at the end instead of the beginning of the year*, and for the year of death, will be $\dfrac{{\scriptstyle\mathrm{A}}\mathrm{I}\mathring{\mathrm{i}}}{\mathrm{I}_{\mathrm{A}} + {\scriptstyle\mathrm{A}}\mathrm{I}\mathring{\mathrm{i}}} = \phi$

or what is the same thing, $\dfrac{{\scriptstyle\mathrm{A}}\mathrm{I}\mathring{\mathrm{i}}}{\dfrac{\mathrm{I}_{\mathrm{A}} + 1}{r}} = \phi$

and $\dfrac{{\scriptstyle\mathrm{A}}\mathrm{I}\mathring{\mathrm{i}}}{\mathrm{I}_{\mathrm{A}} + 1} = \dfrac{\phi}{r}$

therefore as $\frac{\mathrm{AI}\dot{i}}{\mathrm{IA}+1} = p, \quad p = \frac{\phi}{r}$ and $\phi = pr$,

and instead of $\quad \mathrm{V} = (1 - \mathrm{V}i')\,\mathfrak{A}$,

we shall have $\quad \mathrm{V} = (1 - \mathrm{V}i')\,\frac{1}{pr}$

$$\mathrm{V} = \frac{1}{pr + i'}$$

To resume, however, the subject more immediately before us in this paper. The equation

$$\mathrm{V} = \frac{\mathfrak{A}}{1 + i'\mathfrak{A}}$$

offers a very simple rule for the construction of a set of Tables. The rule itself may be thus given in words at length.

"Multiply the amount of an Annuity forborne for *n* years at the "accumulative rate into the remunerative rate, add unity to the product, and multiply the reciprocal of the sum into the amount of the "Annuity forborne, as above, and the product will give the value of "the Annuity required."

EXAMPLE.

Required the present value of an Annuity of £1 per annum for 20 years, the purchaser to make 5 per cent. per ann. interest of his outlay, and to replace his capital by the investment of his surplus Annuity at 3 per cent.

Here the Annuity $= 1$

$'i = \cdot 05$

$(r - 1) = \cdot 03$

and by Tab. III., Author's Doctrine of Int., $\mathfrak{A}$ at 3 per cent. $= 26\cdot 8703$.

$\lambda\ 26\cdot 8703 = 1\cdot 4292677$

$\cdot 05$

$1\cdot 343515$

1

$\lambda\ 2\cdot 343515 = 0\cdot 3698650$

$1\cdot 0594027 = \lambda\ 11\cdot 466 =$ value.

TABLE showing the Present Value of an Annuity of £1 per Annum, for a given Number of Years certain, supposing the Purchaser thereof to take out of the Annuity £5 *per cent.*, £6 *per cent.*, or £7 *per cent.*, per Annum, as an available Interest on his Purchase Money or Capital advanced, while he is only enabled to re-invest the SURPLUS of the Annuity beyond the available Interest, so as to make 3 *per cent.*, 3½ *per cent.*, 4 *per cent.*, or 5 *per cent.* thereof.

YEARS.	Interest to be 5 p. cent.			Interest to be 6 per cent.				Interest to be 7 per cent.			
	The Re-investments to be made at the Rate of			The Re-investments to be made at the Rate of				The Re-investments to be made at the Rate of			
	3 per cent.	3½ per cent.	4 per cent.	3 per cent.	3½ per cent.	4 per cent.	5 per cent.	3 per cent.	3½ per cent.	4 per cent.	5 per cent.
	Value.	Value.	Value.	Value.	Value.	Value.	Value.	Value.	Value.	Value.	Value.
1	·952	·952	·952	·943	·943	·943	·943	·934	·934	·934	·934
2	1·842	1·847	1·851	1·809	1·813	1·817	1·825	1·777	1·780	1·785	1·792
3	2·677	2·688	2·700	2·607	2·618	2·629	2·651	2·541	2·551	2·561	2·582
4	3·460	3·481	3·502	3·314	3·364	3·384	3·424	3·236	3·254	3·273	3·311
5	4·195	4·228	4·262	4·026	4·057	4·088	4·149	3·870	3·899	3·927	3·984
6	4·887	4·931	4·981	4·659	4·702	4·744	4·830	4·452	4·491	4·529	4·608
7	5·540	5·601	5·662	5·238	5·304	5·359	5·470	4·987	5·036	5·086	5·186
8	6·155	6·231	6·308	5·724	5·866	5·933	6·071	5·481	5·540	5·601	5·723
9	6·737	6·828	6·920	6·311	6·391	6·472	6·636	5·937	5·871	6·079	6·223
10	7·287	7·394	7·502	6·792	6·885	6·979	7·168	6·359	6·411	6·523	6.688
11	7·807	7·930	8·054	7·242	7·347	7 454	7·669	6·753	6·844	6·937	7·122
12	8·301	8·439	8·579	7·665	7·782	7·901	8·141	7·119	7·220	7·322	7·529
13	8·769	8·923	9·078	8·062	8·192	8·323	8·586	7·410	7·572	7·683	7·907
14	9·214	9·383	9·554	8·437	8·578	8·720	9·007	7·780	7·900	8·031	8·262
15	9·636	9·820	10·006	8·789	8·942	9·095	9·403	8·079	8·208	8·337	8·595
16	10·038	10·237	10·436	9 122	9·286	9·450	9·778	8·360	8·497	8·633	8·907
17	10·423	10·634	10·847	9 438	9·611	9·784	10·132	8·621	8·768	8·912	9·199
18	10·787	11·011	11·237	9·736	9·919	10·102	10·467	8·872	9·003	9·175	9·474
19	11·134	11·372	11·610	10·019	10·210	10·402	10·782	9·106	9·264	9·421	9·732
20	11·466	11·715	11·965	10·286	10·487	10·686	11·081	9·326	9·491	9 654	9·975
21	11 783	12·043	12·303	10·541	10·749	10·955	11·364	9·535	9·705	9·873	10·206
22	12·085	12·356	12·626	10·782	10·997	11·211	11·632	9 732	9·910	10·084	10·420
23	12·375	12·655	12·936	11·012	11·234	11·454	11·885	9·919	10·099	10·277	10·623
24	12·651	12·941	13·230	11·231	11·459	11·684	12·125	10·096	10·280	10·464	10·814
25	12·916	13·215	13·512	11·438	11·672	11·903	12·353	10·264	10·452	10·637	10·995
26	13·169	13·476	13·781	11·637	11·876	12·111	12 569	10·424	10·615	10·803	11·165
27	13·412	13·727	14·037	11·825	12·070	12·310	12·773	10·575	10·770	10·960	11·326
28	13·644	13·966	14·283	12·006	12·254	12·527	12·967	10·719	10·917	11·110	11·478
29	13·867	14·195	14·518	12·178	12·431	12·678	13·150	10·856	11·056	11·251	11·622
30	14·081	14·415	14·743	12·343	12·599	12·849	13·324	10·987	11·189	11·386	11·757
31	14·286	14·626	14·958	12·500	12·760	13·012	13·490	11·111	11·316	11·514	11·886
32	14·483	14·828	15·164	12·651	12·913	13·167	13·646	11·231	11·437	11·635	12·007
33	14·673	15·021	15·361	12·795	13·060	13·315	13·795	11·344	11·551	11·751	12·123
34	14·854	15·207	15·519	12·933	13·200	13·456	13·936	11·452	11·660	11·860	12·233
35	15·029	15·385	15·729	13·065	13·334	13·591	14·070	11·556	11·765	11·965	12·335
36	15·197	15·556	15·902	13·192	13·462	13·720	14·198	11·654	11·865	12·065	12·432
37	15·359	15·720	16·067	13·314	13·584	13·843	14·319	11·750	11·959	12·160	12·525
38	15·514	15·878	16·225	13·430	13·702	13·961	14·433	11·840	12·050	12·250	12·613
39	15·663	16·028	16·377	13·542	13·815	14·073	14·542	11·927	12·138	12·337	12·696
40	15·808	16·174	16·523	13·650	13·922	14·180	14·649	12·011	12·221	12·419	12·778
41	15·946	16·314	16·662	13·753	14·025	14·282	14·744	12·090	12 300	12 497	12·849
42	16·080	16·448	16·795	13·853	14·125	14·380	14·838	12·167	12·377	12·572	12·921
43	16·208	16·577	16·925	13·947	14·220	14·474	14·927	12·240	12·450	12·644	12·989
44	16·332	16·699	17·046	14·039	14·310	14·564	15·012	12·311	12·520	12·712	13·058
45	16·451	16·820	17·164	14·127	14·398	14·650	15·092	12·380	12·587	12·778	13·113
46	16·567	16·934	17 277	14·212	14·482	14·731	15·168	12·444	12·621	12·840	13·171
47	16·678	17·045	17·385	14·294	14·562	14·810	15·241	12·507	12·712	12·900	13·256
48	16·785	17·150	17·489	14·372	14·369	14·885	15·311	12·567	12·770	12·957	13·278
49	16·888	17·253	17·588	14·448	14·714	14·958	15·376	12·625	12·800	13·012	13·327
50	16·989	17·311	17·684	14·521	14·751	15·025	15·439	12·680	12·882	13·064	13·373
60	17·815	18·153	18·451	15·121	15·363	15·612	15·916	13·136	13·318	13·477	13·731
70	18·405	18·706	18·960	15·530	15·757	15·938	16·208	13·453	13·613	13·747	13·948
80	18·828	19·089	19·300	15·846	16·030	16·178	16·385	13·678	13·815	13·925	14·079
90	19·137	19·358	19·528	16·063	16·219	16·341	16·494	13·840	13·955	14·044	14·159
99	19·313	19·531	19·669	16·208	16·340	16·437	16·556	13·948	14·044	14·116	14·204
100	19·363	19·547	19·682	16·222	16·351	16·446	16·561	13·957	14.053	14·123	14·209

London Assurance Corporation, 7, Royal Exchange,
23d September, 1850.

PETER HARDY.

A General Method of Obtaining the Finite Integral of any Rational Algebraic Function of x: or Summing any Series of which such a Function is the General Term. By WILLIAM ORCHARD, Esq., Fellow of the Institute of Actuaries.

LET $u_x = a_n x^n + a_{n-1} x^{n-1} + \dots\dots + a_1 x + a_0$ be the given function, then, by a well known theorem

$$u_x = u_0 + x \Delta u_0 + \frac{x(x-1)}{1 \,.\, 2} \Delta^2 u_0 + \frac{x(x-1)(x-2)}{1 \,.\, 2 \,.\, 3} \Delta^3 u_0 + \&c. \qquad \text{(A)}$$

the integral of which, since u_0, Δu_0. $\Delta^2 u_0$, &c., are constants, and

$$\sum \frac{x(x-1)(x-2)\,..\,(x-p)}{1 \,.\, 2 \,.\, 3 \,...\, (p+1)} = \frac{x(x-1)\,..\,x-(p+1)}{1 \,.\, 2 \,.\, 3 \,.\, (p+2)}$$

will be

$$\sum u_x = x u_0 + \frac{x(x-1)}{1 \,.\, 2} \Delta u_0 + \frac{x(x-1)(x-2)}{1 \,.\, 2 \,.\, 3} \Delta^2 u_0 + \&c. \qquad \text{(B)}$$

which differs from (A) only by the coefficients of Δu_0, $\Delta^2 u_0$, &c , being shifted each one place to the left.

The labour of integration is then reduced to finding the constants u_0, Δu_0, $\Delta^2 u_0$, &c. which requires the computation of u_x for $x = 0 = 1 = 2 = \dots = (n-1) = n$; these values differenced, as in the annexed form, will then determine such constants:

$$\begin{array}{cccc}
u_0 & & & \\
 & \Delta u_0 & & \\
u^1 & & \Delta^2 u_0 & \\
 & \Delta u_1 & & \Delta^3 u_0 \\
u_2 & & \Delta^2 u_1 & \\
 & \Delta u_2 & & \\
u_n & & &
\end{array}$$

The computation of u_0, u_1, u_2, &c., will be very easy, as $u_0 = a_0$, $u_1 =$ the algebraic sum of the coefficients, and the others requiring but trifling operations, as will appear by the examples, in which they are fully given; it will only be necessary to compute $u_0, u_1, \dots u_{n-1}$, since from these Δu_0, $\Delta^2 u_0, \dots \Delta^{n-1} u_0$, may be found, $\Delta^n u_0$ being known to be $= a_n \times n(n-1) \dots 2 \,.\, 1$.

If the coefficients of u_0, Δu_0, &c., in (B) be denoted by X_1, X_2, &c., (they are the successive binominal coefficients for index x),

$$\sum u_x = u_0 . X_1 + \Delta u_0 . X_2 + \Delta^2 u_0 . X_3 + \&c. \qquad \text{(C)}$$

Example 1. $u_x = x^2$.

$$\begin{array}{cc}
0 & \\
 & 1 \\
1 &
\end{array} \qquad \therefore \sum x^2 = 0 + \frac{x(x-1)}{1 \,.\, 2} + 2\,\frac{x(x-1)(x-2)}{1 \,.\, 2 \,.\,.\, 3}$$

this particular case may be more compactly represented thus

$$\sum x^2 = \frac{x(x-1)}{1 \,.\, 2}\left(1 + \frac{2(x-2)}{3}\right) = \frac{x(x-1)(2x-1)}{1 \,.\, 2 \,.\,.\, 3}$$

Example 2. $u_2 = x^3$.

$$\begin{array}{lll} 0 & & \\ & 1 & \\ 1 & & 6 \\ & 7 & \\ 8 & & \end{array} \qquad \sum x^3 = \frac{x\,(x-1)}{1\,.\,2} + 6\,\frac{x\,(x-1)\,(x-2)}{1\,.\,2\,.\,.\,3} + 6\,\frac{x\,(x-1)\,(x-2)\,(x-3)}{1\,.\,2\,.\,.\,3\,.\,.\,4}$$

Example 3. $u_x = x^2 + 5x - 4$.

$$\begin{array}{ll} -4 & \\ & +6 \\ +2 & \end{array} \qquad \sum u_x = -4x + 6\,\frac{x\,(x-1)}{1\,.\,2} + 2\,\frac{x\,(x-1)\,(x-2)}{1\,.\,2\,.\,.\,3}$$

Example 4. $u_x = 4x^3 - 5x^2 - 14x + 56$

$$\begin{array}{rrrl} & +3 & -8 & +40 = u_2 \end{array}$$

$$\begin{array}{lll} +56 & & \\ & -15 & \\ +41 & & +14 \\ & -1 & \\ +40 & & \end{array} \qquad \sum u_x = 56X_1 + 15X_2 + 14X_3 + 24X_4$$

Example 5. $u_x = x^4 + 15x^3 - 4^{x^2} + 3x + 5$

$$\begin{array}{rrrrl} +17 & +30 & +63 & +131 & = u_2 \\ +18 & +50 & +153 & +464 & = u_3 \end{array}$$

$$\begin{array}{llll} +5 & & & \\ & +15 & & \\ +20 & & +96 & \\ & +111 & & +126 \\ +131 & & +222 & \\ & +333 & & \\ +464 & & & \end{array}$$

$$\sum u_x = 5X_1 + 15X_2 + 96X_3 + 126X_4 + 24X_5$$

Example 6. $u_x = x^5 + 10x^4 - 7x^3 + 14x^2 + 9x - 24$

$$\begin{array}{rrrrrl} +12 & +17 & +48 & +105 & +186 & = u_2 \\ +13 & +32 & +110 & +339 & +993 & = u_3 \\ +14 & +49 & +210 & +849 & +3372 & = u_4 \end{array}$$

$$\begin{array}{lllll} -24 & & & & \\ & +27 & & & \\ & & +156 & & \\ +3 & & & +468 & \\ & +183 & & & +480 \\ & & +624 & & \\ +186 & & & +948 & \\ & +807 & & & \\ +993 & & +1572 & & \\ & +2379 & & & \\ +3372 & & & & \end{array}$$

$$\sum u^x = -24X_1 + 27X_2 + 156X_3 + 468X_4 + 480X_5 + 120X_6$$

The value of the algebraic expressions in the preceding examples for $x = 2 = 3$, &c., has been found by Horner's method, which is this: write down the coefficients of the expression in their usual order, with a cypher as the coefficient of any missing term, multiply the highest coefficient by the value of $x = h$, adding the product to the second, and so on, to the end; thus, if $ah^3 + bh^2 + ch + d$ were required, the successive results found would be $ah + b$, $ah^2 + bh + c$, $ah^3 + bh^2 + ch + d$.

This process repeated, stopping each time at one term short of the preceding, until all are exhausted gives the result of writing $x + h$, for x in any algebraic function, which has been applied by Horner to the resolution of numerical equations.

In summing a series of which u_x is the general term, $\sum u_{x+1}$ is required, which corresponds with increasing x by unit in X_1, X_2, &c.

There are many occasions on which it is necessary to obtain Δu_x, $\Delta^2 u_x$, $\Delta^3 u_x$, &c., u_x being an algebraic function.

When the degree of the expression is not higher than the third, perhaps the easiest way is to use the particular case of Taylor's Theorem $(h = 1)$

$$F(x+1) - Fx = \Delta Fx = F'x + \frac{Fx''}{1.2} + \frac{Fx'''}{1.2.3} + \&c.$$

but in more complex expressions it will be better to apply Horner's method, of which it is the most simple case: subtracting from the coefficients at the close of each operation, the coefficients as they stood at the commencement. An example will make this clear.

$$\begin{array}{lllllll}
4x^5 & +\ 5x^4 & -\ 7x^3 & +\ 1x^2 & +\ 15x & -\ 14 = u_x & \\
 & +\ 9 & +\ 2 & +\ 3 & +\ 18 & +\ 4 & \\
 & +13 & +\ 15 & +\ 18 & +\ 36 & & \\
 & +17 & +\ 32 & +\ 50 & & & \\
 & +21 & +\ 53 & & & & \\
 & +25 & & & & & \\
\cline{2-6}
 & +20x^4 & +\ 60x^3 & +\ 49x^2 & +\ 21x & +\ 18 = (u_{x+1} - u_x) = \Delta u_x & \\
 & & +\ 80 & +129 & +150 & +168 & \\
 & & +100 & +229 & +279 & & \\
 & & +120 & +349 & & & \\
 & & +140 & & & & \\
\cline{3-6}
 & & +\ 80x^3 & +300x^2 & +358x & +150 = (\Delta u_{x+1} - \Delta u_x) = \Delta^2 u_x & \\
 & & & +380 & +738 & +888 & \\
 & & & +460 & +1198 & & \\
 & & & +540 & & & \\
\cline{4-6}
 & & & +240x^2 & +\ 840x & +1738 = \Delta^3 u_x & \\
 & & & & +1080 & +1818 & \\
 & & & & +1320 & & \\
\cline{5-6}
 & & & & +\ 480x & +1080 = \Delta^4 u_x & \\
 & & & & & +\ 480 = \Delta^5 u_x &
\end{array}$$

The Calculus of Finite Differences is coming daily into so much greater requisition in investigations of the Theory of Life Assurance, that we willingly insert Mr. Orchard's Paper, although it has no other immediate reference to the subjects usually treated of in this Magazine.—Ed. *A.M.*

Supplementary Remarks, by Mr. Frederick Hendriks, "*on Auxiliary Tables for Life Contingencies,*" *including Notice of a recent Table by* W. T. Thomson, Esq. F.R.S.E., Manager of the Standard Life Assurance Company.

Having been favoured by Mr. W. T. Thomson with a copy of his large Table, "Carlisle 3 Per Cent.," and believing that the insertion of a notice of such laborious and useful computations as are brought together in that extensive work is in accordance with the objects of the *Assurance Magazine*, I beg to offer a brief explanation of some of the most important features of the Table: and such notice will afford an opportunity of referring to particulars which it appears desirable to annex to those submitted in my former paper.

In a communication from Mr. Thomson, that gentleman writes as follows:—

"Edinburgh, 19th October, 1850.

"Mr. Thomson observes, at page 18 of the *Assurance Magazine*, reference to the principle on which his Table is constructed, and requests particular attention to the fact that in his Table he actually deals with the *decrements* as well as with the living—for the difference between any two columns adjoining gives the value of the discounted decrements at the older age—and the "conversion column," at the end of the Table is constructed on that principle, D column being discounted one year more to give the "conversion column," the difference being the C column. Mr. Thomson did begin a Table of discounted decrements, but soon found that the differences gave these, and abandoned it. For example (see large Table),

Age 94	109·42538	
95	82·70815	
Difference = value of discounted decrements	26.71723	= ·890574 Value of reversion whole term.
(living at 95) .	30	
Again, Age 94	80·29917	
95	60·37805	
Difference = value of discounted decrements deferred one year..................................	19·92112	= ·66404 Value of reversion deferred one year.
	30	

"Mr. Thomson thinks it right further to observe, that he was not aware of Teten's formulæ when he calculated his Table, and has had much pleasure in reading Mr. Hendrik's paper."

The annexed extract from the Table will serve as the example for present consideration and comparison:

Ages.		103	102	101	100	99
No. living.		3	5	7	9	11
Ages.	No. living.					
104	1	·97087	·94260	·91514	·88849	·86261
103	3	....	2·91262	2·82779	2·74542	2·66546
		Sum	3·85522	3·74293	3·63391	3·52807
102	5	....	....	4·85437	4·71298	4·57571
			Sum	8·59730	8·34689	8·10378
101	7	....	....	....	6·79612	6·59817
				Sum	15.14301	14·70195
100	9	....	....	....	....	8·73786
					Sum	23·43981
99	1	....	....	....	....	....

The thanks of those whom the matter concerns are due to Mr. Thomson for the industry and energy which have carried out the computation and printing of one of the most extensive collections of *details* ever brought forward with respect to a Table of Annuities on a *single life* at every age, and in that regard Mr. Thomson's Table completes the publications upon the Carlisle scale by Messrs. Milne, Sang, Gray, and others.

The formula which Mr. Thomson's Table represents may be thus described:

Let l_m = number of living in the Table at age m; l_{m+1} the number at age 1 year older than m; l_{m+2} the number at 2 years older, and so on up to x years, or the difference between age m and the oldest life in the Table.

Let v = present value of £1 due at end of 1 year, v^2 the present value of £1 due at end of 2 years, and so on up to x years: then,

$$l_{m+1}\, v + l_{m+2}\, v^2 + + l_{m+x}\, v^x$$

is equivalent to the aggregate present value at age m of as many separate Life Annuities as correspond *in number* with l_m or the number of living at age m indicated by the Table; consequently as such aggregate present value is $= a_m . l_m$, it becomes the numerator of that fraction which is the elementary formula for computation of a single Life Annuity; viz.

$$\frac{l_{m+1}\, v + l_{m+2}\, v^2 + + l_{m+x}\, v^x}{l_m} = a_m,$$

and Mr. *Thomson's arrangement* (§3) is the detailed exposition of the component parts of the numerator of the above fraction, for every age of a single life, by the Carlisle observations and at 3 per cent. interest.

Dr. Halley's formula, expressed in the same notation, points out the identical arrangement; viz.

$$\frac{l_{m+1}v}{l_m}+\frac{l_{m+2}v^2}{l_m}+\;+\frac{l_{m+x}v^x}{l_m}=a_m,$$

the denominator being *common* to all the numerators.

The following extract is from Dr. Halley's paper in the Philosophical Transactions for 1693, and to those who have not yet had an opportunity of its perusal, it will not be unprofitable, as it contains the first practical application of the theories of Probability and Interest to the computation of Life Annuities :—

"On this depends the valuation of Annuities on lives; for it is plain that the purchaser ought to pay for only such a part of the value of the Annuity, as he has chances that he is living; and this ought to be computed yearly, and the sum of all those yearly values being added together, will amount to the value of the Annuity for the life of the person proposed. Now the present value of money payable after a term of years, at any given rate of interest, either may be had from Tables already computed, or, almost as compendiously, by the Table of Logarithms, for the arithmetical complement of the logarithm of unity and its yearly interest being multiplied by the number of years proposed, gives the present value of one pound payable after the end of so many years. Then by the foregoing proposition it will be: as the number of persons living after that term of years, is to the number dead, so are the odds that any one person is alive or dead—and consequently as the sum of both, or the number of persons living of the age first proposed, is to the number remaining after so many years (both given by the Table), so is the present value of the yearly sum payable after the term proposed, to the sum which ought to be paid for the chance the person has to enjoy such an Annuity after so many years. And this being repeated for every year of the person's life, the sum of all the present values of these chances is the true value of the Annuity."

Dr. Halley thus professedly calculated each year's rent separately, but in so doing, as he used a *common denominator*, the question of one aggregate division or of separate partial divisions for subsequent summation, was so entirely dependent on the same principle, that the convenience or requirements of the computer were the only rules to be consulted in that respect, and where time was an object and the Annuity values required without those for sums deferred on attaining certain ages, the preferability of the aggregate final division was self-evident, and doubtless employed at that time by other computers of Annuity Tables, and the expediency of shortening such calculations did not escape at least the *wishes* of Dr. Halley, as may be seen in his Paper in the Philosophical Transactions, entitled, "Some further considerations on the Breslaw Bills of Mortality. (Anno 1693, No. 198.)" The reader need scarcely be reminded that the formula above described was the *only* one available until the publication of Simpson's discovery of the method of deriving the value of a Life Annuity at a given age from the value at an age one year *older*. And that method was first published in 1742, in Simpson's "Doctrine of Annuities and Reversions." (See page 18 of 2nd edit. of 1775.)

Thus far only the latent existence of the arrangement has been referred to;—we have next to consider a case where it was really employed.

In the year 1772 a Mr. William Dale published a work entitled, "Calculations deduced from first principles in the most familiar manner, by plain Arithmetic; for the use of the Societies instituted for the benefit of Old Age: intended as an Introduction to the Study of the Doctrine of Annuities. By a Member of one of the Societies."

It would exceed a necessarily limited space to give any detailed account of the above book, which in some respects is singularly original, and it will be sufficient to direct attention to certain passages which, as it happens, are *most material* in the history of the origin of auxiliary Tables for Life Contingencies.[*]

Dale's method of obtaining the values of Temporary and Deferred Life Annuities, which he takes nearly 40 pages to describe, is based entirely on the use of the partial summations of the numerators of the fraction

$$\frac{l_{m+1}\,v + l_{m+2}\,v^2 + + l_{m+x}\,v^x}{l_m}$$

before alluded to (in the 6th section of the present paper) as representing Mr. Thomson's Table.

Dale's Annuity values are computed as payable half-yearly; this, of course, is a difference merely in the data applied.

The following abridged extract will give Dale's own view of the Table:—

"§ CVI. The method to find the value of an Annuity *during life* will be like that already used to find the value of an Annuity for a limited time, proceeding in the same manner to multiply the *number of survivors* into the *reversion* of the next half year, and continuing it to the end of life; that is, as long as the Tables show that one is living. The total of all the sums added will show the capital stock that will pay the number of Annuitants *living* at the *commencement* of the Table, £2 annuity during life.

"These calculations being made for the use of the Societies *in particular* who commence annuitants at the age of fifty, it was not thought necessary to begin the Tables at a younger age.

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[*] The way in which Dale treats his subject is both laborious and diffuse,—his admissions are ingenuous enough in that regard—and if those who are still found to advocate the explanation of mathematical rules without their generalization or reduction to formulæ and symbolic notation, would but read Dale's book *carefully through*, the process in many cases would lead to their entertaining a very different opinion. Let those, however, to whom the matter is new, first peruse the notice respecting a certain error of Dale, which is given in Baron Maseres' work, "The Principles of the Doctrine of Life Annuities, &c. London: 1783."

" A Table to find the Value, in present money, of £1 immediate Annuity during life, from fifty to any age upwards, at the rate of 3½ per cent. per annum, per half-yearly payments, and the Table of Mortality calculated from the London Bills for the last Forty-three years—(1728 to 1770).

Ages.	Living.	Reversion.	Product.	Totals.
50	221			
50½	216½	× ·9828009	= 212·77639485	4749·67697485
51	212	× ·965898	= 204·770376	4536·90058
*	*	*	*	*
60	140	× ·706824	= 98·95536	1850·7472315
60½	136½	× ·694668	= 94·822182	1751·7918715
*	*	*	*	*
91½	2½	× ·236943	= ·5923575	1·736835
92	2	× ·232865	= ·46573	1·1444775
92½	1½	× ·228862	= ·343293	·6787475
93	1	× ·224926	= ·224926	·3354545
93½	½	× ·221057	= ·1105285	·1105285

"The totals in the fifth or last column are added together in this manner: The *product* at the age 93 is added to that opposite the age 93½; the product opposite 92½ is added to the total of the *two* last; the product opposite the age 92 is added to the total of the *three* last; the product of the age 91½ is added to the total of the *four* last; and so on, in like manner, from the *end* to the *beginning*; where the total of *all* the payments is found to be 4749·67697485, which is the capital stock that will pay 221 persons, aged fifty, an immediate Annuity of £2 during life, according to *this* Table of Mortality.

" The use of this method is to show the sum that would pay the same number of persons, of the *same* age, the same Annuity, after any number of years reversion. Suppose the age fifty, *not* to commence Annuitant till the expiration of 10 years, it would receive none of the *first* 20 payments; and opposite the age 60½, when he would become recipient of the *first* payment, is the sum of £1751·7918715, which is the capital stock that would pay 221 persons aged fifty, an Annuity of £2 during life, to commence when aged 60. That stock divided by the 221 persons gives 7·92666 for £2, or £3·96333 for the value of £1 Annuity; and in like manner for any other time of reversion.

" By this Table, also, the value of an *immediate* Annuity for any age above *fifty* may be found thus—What is the worth of an *immediate* Annuity of £1 for the age sixty during life?

"The total of all the payments *this* age would have a chance of receiving is opposite the age 60½ in the fifth column, the same as before, 1751·7918715; but the sums are all multiplied into 20 half-years reversion more than should be for an *immediate* Annuity for *this* age; therefore the total sum must be *divided* by 20 half-years *reversion*, or *multiplied* by 20 half-years *compound* interest, to restore it to *present* value; for the age is supposed by the question to receive the *first* payment at the expiration of 6 months, *not* at the expiration of 21 *half-years*.

$$·706824)\ 1751·7918715\ (\ 2478·398$$
$$\text{or } 1751·7918715 \times 1·41477819 = 2478·398,$$

and let it be divided by the 140 persons supposed by this Table to be living at *sixty*, and the quotient will be 17·7028 for £2 Annuity, or £8·8514 for answer to the question."

The reader will understand that the preceding explanatory passages are applicable to Mr. Thomson's arrangement, which is identical with Dale's for a single life. Among the other uses of the Table is the obtaining of the values of Endowments on surviving a fixed term of years, by the formula $\frac{l_{m+n}.v^n}{l_m}$, also of the value of sums receivable at decease, by taking the difference between the summation at the given age and that at one year younger, and dividing by l_m the common denominator. In fact, the utility of the Table is so interwoven with the general *elementary* theory of Annuities and Assurances as not to require more than a reference to the latter to prove it.

Dale applied the method to *one* age only in each rate of mortality used, viz., (besides the Table above quoted,) to age fifty according to Dr. Halley's Breslau Observations (1687 to 1691), to age of forty by Simpson's London Observations, published 1742, and to age of fifty by Dr. Price's London Table of 1759 to 1768.

Dale's Table thus contained the latent *type* of the D and N columns, which would have occurred *in reality* had he thought it *necessary* to compute but one of his Tables to be applicable to the *youngest age*, *i. e.* at 1 year *next birthday*, for in such case the number living at age $1 = l_1$ being multiplied into the present value of £1, receivable at end of one year $= v$, and l_2 by v^2, the product for any age m would have been $= l_m . v^m$ or Column D_m; and its summation

$$= l_m v^m + l_{m+1} v^{m+1} + + l_x v^x = N_m$$

(or N_{m-1} of more modern form,) and *on such a principle*, columns 4 and 5 of Dale's Table would have contained the complete foundation of a plan which was lost sight of by him in his *partial use* of his columns 2 and 5. Looking, however, to the character of his work, and to its candid representations, as to the disadvantages under which he laboured, it would seem almost certain that *had it so happened* that any necessary computation led to the D and N columns, it would not have induced his perception of having arrived at a general method. He doubtless possessed a large share of shrewdness and practical good sense; but, with similar qualities, the Schleswig Professor Tetens combined the advantages of cultivated and scientific attainments; and it would be difficult, indeed, to prove that such a man as Tetens required a *suggestive source* for a simple arrangement, which was an almost obvious result of the degree of study he devoted to generalising and elucidating the principles of the commutation method.

Before concluding, it may be desirable to annex an Example calculated by Tetens' Fifth Formula (see page 9 of this Magazine), and based on the Carlisle observations and rate of Interest 3 per cent., for comparison with the extract at same ages by Mr. Thomson's arrangement, as given in page 13.

Ages.		103	102	101	100	99
No living.		3	5	7	9	11
Ages.	Decrements or No. dying.					
104	1	·970874	1·913470	2·828611	3·717098	4·579707
103	2	....	1·941748	3·826940	5·657222	7·434196
102	2	....	....	1·941748	3·826940	5·657222
101	2	....	....	....	1·941748	3·826940
100	2	....	....	....	....	1·941748
99	2	....	....	....	....	....
	Sums	·970874	3·855218	8·597299	15·143008	23·439813

The *final* summations of the series given by the two methods are identical, and the Annuity values for the whole term of life are derived from the division of the sums by the number of living at the given age, as at the head of each column. The above Example will afford an excellent proof of the certainty of the manner in which the laws of probability are applied to the computation of Life Annuities. Let the above numerical results at age of 99 be considered. The Carlisle Table indicates (see 2nd column) that out of 11 persons living at that age, 2 certainly *die before* the end of one year, and a like number out of the original 11, *before* each of the 2nd, 3rd, 4th, and 5th years have respectively elapsed, leaving 1 survivor at age of 104 who does not outlive one year. An Annuity of £1 is consequently received by each for as many years certain as they survive *complete* years, the discounted value of an Annuity for 1 year certain has then to be multiplied by the number who die in the 2nd year, and the discounted values of Annuities *certain* for 2, 3, 4, and 5 years each, respectively, by the number who die in the 3rd, 4th, 5th, and 6th years. Such present discounted values being summed up, give the worth of 11 Annuities, payable to as many lives of the age of 99; equivalent, as above, to £23·439813, and one-eleventh of this sum, being £2·130892, is the present value of the single life Annuity at that age, according to the above record of observations.

8th Nov., 1850. F.H.

On the Contrivances required to render Contingent Reversionary Interests Marketable Securities.

We have been favoured by Mr. Thomson, the Actuary of the Standard Life Assurance Company, and one of the Vice-Presidents of the Institute, with a copy of certain cases submitted to Mr. Edward Sang, and of his opinion in reference thereto. The matters to which they relate are of so much practical importance, and the learning and ability of Mr. Sang are so well known, that we gladly avail ourselves of Mr. Thomson's kind permission to publish them, and feel we need offer no apology to our readers for giving them entire. We shall have some observations to offer upon each question, and upon the solution of it; but these we defer till the conclusion of the Paper. The first question is as follows:—

B., aged 30, requires an advance of £100, and in consideration thereof offers to convey to the lender a sum of money, payable at the death of A, aged 58, in the event of his surviving A. What sum should be demanded on his death, and B's survivance, so as to allow the lender to secure himself by an assurance of B's life against A's, and to cover interest at the rate of 6 per cent. Also what sum should be assured from the commencement, so as to cover the risk entirely throughout, but not to a greater extent than the calculation warrants.

Mr. Sang is requested to give his opinion as much in detail as possible.

OPINION.

The solution of this question must be obtained indirectly by considering the inverse question, "What present advance should be made in consideration of a certain reversionary right to be assigned?" A simple proportion leads from the solution of the one question to that of the other; also, it is most convenient to assume unit as the sum to fall due at the specified succession.

A person, B, possesses the right of succeeding to a fund or property, provided he be alive when a certain event shall happen, and he wishes to dispose of that right or expectation. The person proposing to purchase it, in making his estimate of the price, takes into account the probability of B surviving the specified event, and also demands a rate of interest sufficient to induce him to enter into the transaction, and besides, he weighs the advantage which the seller has over him in an intimate acquaintance with the healths of the parties. Hence, if the reversion be absolute, one rate of interest may be sufficient, while, if the reversion be contingent, a higher rate may be required. In this is the origin of the expedient of converting a contingent into an absolute reversion by means of a Policy of Assurance. The investigation into the health of the borrower, which invariably precedes the granting of a Policy of Assurance, serves, at the same time, to diminish the advantage which he possesses in this respect over the lender. Now, it is clear that since B possesses only the expectation of a contingent reversion, he cannot offer for sale an absolute inheritance, and cannot possibly convey to the purchaser such an expectation unless he be able to induce some third party to undertake the risk of his decease previous to the occurrence of the event on which his expectation depends. Whatever sum he may pay to the Assurer for the underwriting of this risk, it would seem that just by so much will the value of his expectation be increased, and that he will thus have in hand the same balance as if there had been no re-assurance, so that it may be expected to be a matter of indifference to him according to what scheme the Policy of Assurance may be obtained. Such, however, is not the case, for on account of the difference between the rate of interest allowed by the

Assurer, and that demanded by the lender, the sum paid for the Policy is greater than the allowance made for it, and thus it happens that the re-assurance influences materially the purchase-money of the expectation.

There are, in general, two ways in which the Assurance may be taken, so as to convert the contingent into an absolute reversion, viz., either by assuring the amount as payable at the occurrence of the specified event, provided B be then dead, or by making it payable at the death of B, should he die before his succession to the fund. The latter is the method proposed in the prefixed memorandum, and is also, as will immediately appear, the preferable one. Yet, for the sake of obtaining a general view of the subject, it may be well to consider both cases. These Assurances again may be paid for in a great variety of ways, and it is expedient to contrast the results of several of these modes. For it is reasonable to expect that as the re-assurance is extrinsic to the expectation possessed by B, the manner in which it may be gone about ought not to affect the value of that expectation. The results, are, however discordant, and the *Reporter*, confiding in the perfect consistency of all results obtained by the application of sound principles, cannot avoid the inference that there lurks some imperfection or impropriety in the general features of the transaction.

The present value of the succession of B, aged 30, to A, aged 58, computed at 6 per cent. from the Carlisle Bills is £·40401; but before paying this, the purchaser requires B to effect an Assurance for £1, payable in the event of his death, while A is alive. When B shall have effected this Assurance he will be able to offer for sale an absolute reversion to fall due at the first death of A or B, the value of which, computed also at 6 per cent. is ·50280, and this is the sum which, on the supposition that B has charged himself with the Assurance, the purchaser ought to pay. Now, if the cost of that Assurance, viz., of A's succession to B be computed also at 6 per cent. it comes out ·09879, that is, as is well known, just the difference between the values of the contingent, and the absolute reversion. In this way the seller of the reversion receives the same amount whether there be an Assurance or not, and by whatever process the policy may be obtained, or under whatever form it may be taken, provided it result from computations at 6 per cent. the actual balance to be paid to B, will still remain ·40401. But when the price of the Assurance is computed at a different rate, say 3 per cent., the sum to be received by B, varies with the manner in which that Assurance is obtained, as will appear from the examination of the following cases:—

Case 1.—Let the Assurance for £1, payable at the death of A, provided B be then dead, be purchased by a single payment.

In this case the price of the Assurance computed at 3 per cent. is ·09500, while the reversion, as modified by it, is effectively to fall due at the death of A, without any reference to whether B be then dead or alive. Now the value of a reversion absolute at the death of A is ·46005; out of this sum, the above price of Assurance has to be defrayed, leaving to B the clear proceeds ·36505, so that by this mode of reassurance, B sustains a loss of ·03896 for every £1 of his inheritance, or nearly of 10 per cent. of its actual value.

This loss may also be exhibited thus: the prices of an Assurance of £1 at A's death, if it happen after B's, computed at 3 per cent. and at 6 per cent. are ·09500 and ·05604. The first is the price at which B is compelled to purchase the Assurance, while the second is that at which he is obliged to sell it,—the difference ·03896 being the loss which he sustains on this branch of the transaction.

Case 2.—Let the assurance for £1, payable at B's death, if it happen before A's, be purchased by a single payment.

The single payment for this assurance computed at 3 per cent. is ·12730, and the value of the absolute reversion at the first death of A or B, taken at 6 per cent. is ·50280, leaving a balance of ·37550 to B. The loss occasioned by this form of the transaction is thus .02851, or about three-fourths of the loss by the former method.

The same result may be obtained by taking the difference between ·12730 and ·09879. The prices computed at 3 and at 6 per cent. of an assurance of £1 at B's death if before A's.

The difference between the two losses arises in this way, that B in each case is made to borrow a sum of money at 6 per cent., for which he is only allowed 3 per cent. by the assurance office. In the first case there is a smaller sum of money borrowed, but that circumstance is more than compensated by the greater length of time over which the loan extends.

Case 3.—Let the assurance of £1, payable at B's death, if first, be purchased by uniform annual premiums.

Here we must assume that B does not possess any fund which may furnish security that the premiums shall be regularly paid, and that therefore the purchaser of the reversion must himself advance the premiums as they fall due, expecting 6 per cent. interest on these premiums from the date of their payment.

The annual premium computed at 3 per cent. for an assurance of £1 at B's death, if first, is .01144. The lender, then, is to advance this annually during the joint life of A and B, whence we must multiply it by 9·039, the value at 6 per cent. of a joint-life annuity, to obtain the present value to the purchaser. This comes out ·10342, and must be deducted from ·50280, the value of the reversion of £1 at the first death, leaving to B as the proceeds of the transaction ·39938. The loss in this case is only .00463, or hardly one-sixth of that caused by the purchase of the assurance by a single payment.

The extent and origin of this loss may be better seen by considering, that while ·01144 is the premium of assurance computed at 3 per cent., that computed at 6 per cent. is only ·01093. Now, if the latter premiums had been exacted, there would have been no loss, as the whole transaction would then have been done at 6 per cent., the difference between the two premiums, which is ·00051, is thus expended in an annual loss—that is, the lender considers that he must pay ·00051 annually more than the assurance is worth to him, and he therefore deducts the present value of that annual payment from the intrinsic value of the reversion. This deduction is ·00051 × 9·030 = ·00461, as before (the slight difference arises from neglecting the after figures).

In this transaction B borrows annually a sum of money at 6 per cent., to be handed over to the assurer who allows 3. The whole premium, however, is not borrowed since the lender receives, and enjoys each year, the additional value of the assurance. This circumstance, together with the shorter time during which the difference of interest operates, occasions the small comparative loss in this form of the transaction.

Here it is to be noticed that the net 3 per cent. premium has been used, yet the assurer may charge something additional. The same principles will, however, apply to the actual premium.

(*To be continued.*)

On the Determination and Division of Surplus, and on the Modes of returning it to the Contributors.

CONSIDERING the undeniable importance of a conformity to correct principles in carrying out the processes which must be resorted to for the purposes above mentioned, it is not a little remarkable that no work exclusively on the subject has hitherto appeared. If we except Mr. De Morgan's and Mr. Sang's Essays and the Observations scattered through the writings of Mr. Babbage, Mr. David Jones, Mr. Samuel Brown, and one or two others, we believe it may be truly said that scarcely any allusion to it is to be found.

We therefore propose, as many of our readers are interested in the discussion of such questions, and in the establishment of right methods in regard to them, to give some account of what appears to us to be the correct mode of proceeding. We have on former occasions endeavoured to establish some fundamental principles in connection with the subject, which we are satisfied cannot be controverted, and to these we shall still adhere. Further allusion to them now is needless, since they must necessarily be developed, and their accuracy more or less confirmed, as the several operations we propose to detail come to be described.

Let us suppose, then, that we are called upon, in the first place, to determine the present value of the Risks of a Life Assurance Company, and thence the amount of surplus divisible amongst its members. Now it is evident that the payments required by the Company or the premiums charged form no guide to us in this inquiry, they are intended not merely to provide for the sum assured, they include in addition a provision against adverse fluctuations and one to defray from year to year the expenditure of the establishment. These will clearly be required in every year to come as much as in those which have passed, and therefore must be carefully set aside for the purposes in question; but the portion of the premiums to be thus set aside must depend on that which is required to provide for the sum assured; so that the first consideration is to determine what part of the premium charged must be calculated upon as provision for the sum guaranteed under the policy. This again involves the further inquiry what rate of mortality may be expected in future to prevail, and what rate of interest will actually be realized. It is evident that these questions can only be answered, with anything like an approximation to the truth, by a reference to the past, although there may exist circumstances which we have reason to know will influence the future, and render it prudent to modify accordingly whatever deductions we may be enabled to obtain from experience.

It will no doubt, however, constantly happen that the particular Society with which we have to do will not, either from its want of extent or from its recent establishment, supply the required information, and in such cases we can only be guided by what has been observed in similar associations, making due allowance for any peculiarities in the one not possessed by the other. Thus as regards mortality we have the experience of the Offices of the Equitable, and of the Amicable, all more or less confirmed by the Carlisle Table.

Some exercise of judgment will, no doubt, be required to determine which particular experience is best adapted to the case in point. It must, however, be remembered that there is no reason why corrections should not be applied at subsequent valuations. It is not to be expected that one unvarying rate will prevail throughout the existence of an Association lasting, it may be, for centuries. If the variations occur we must either persevere in an erroneous course, or apply such corrections so soon as we are satisfied of their necessity;—in other words, we must judge on each occasion what experience most nearly resembles that we may look to have, and avail ourselves of it accordingly, taking especial care not to change our course till we are quite satisfied that there is good reason for it.

The rate of interest actually realized is not difficult to ascertain ; a careful sifting of the accounts for the years which have succeeded the last valuation will afford the means of determining it with tolerable accuracy. It will be needful, of course, to limit the inquiry to the rate of improvement of the premium fund, taking credit only for such interest as remains after other demands upon it have been satisfied. In this element, however, it is well known that much greater fluctuations are to be looked for than in that of mortality, and therefore it will be the more necessary to watch it carefully as the succeeding occasions arise, and to apply such corrections, in other words, to adopt such altered rate as the circumstances may seem to require, or rather can be shown fully to warrant.

Having, then, determined on the true rates to be adopted in our calculations, and being provided with the usual Tables of annual and single Premiums, Annuities, &c., answering to such rates, our next object will be to make a classification of all the assurances in accordance with the years in which the lives assured may be severally born. We are aware that it is a very common practice to estimate the value of each assurance separately, in which case such a classification is of course not needed. The only good reason for a separate estimate arises in the, also common practice, of dividing the surplus in proportion to the difference between the amount of premiums at compound interest and the value of each assurance, and this, it will be seen, renders the determination of the latter indispensable.

We believe, however, that we have clearly demonstrated on a former occasion that such a mode of division is entirely erroneous, and therefore there is no longer any corresponding advantage to compensate the excessive labour attendant upon a valuation of each risk separately; on the contrary, a very great disadvantage arises from the increased liability to error which such a proceeding necessarily involves. As regards any difference in the results of a separate and classed valuation, all experienced computers will at once admit that it is wholly insignificant. We believe we are quite within the mark in saying that the results would be identical even when the number of assurances in each class does not exceed six or eight. If the number in many of the classes be less than these there is certainly nothing to be gained by a classification, but otherwise it is undeniably the preferable alternative.

In proceeding to make the required classification it will be found most convenient to assume that all the lives were born on that day of the year at which the valuation is supposed to be made*; and we would suggest, also, that the entries be regulated by the date of birth, and not by the *office age.* The lives in each class will thus, on the average, complete a given number of years on the day to which the accounts are made up. We are not ignorant that it is usual to adopt the office age, on the plea that the error, on the average, of half a year in each case caused by this arrangement, is in favour of the office. It is better, however, if avoidable, that there should be no error, that the truth should be rigorously adhered to throughout, and that any safeguards which may be required should be matter of distinct consideration.

As will appear hereafter, it is not necessary to make any distinction between participating and non-participating policies;—the two may be blended together, provided only that they are for the whole term of life and at a uniform premium: it may perhaps be desirable to affix some distinguishing mark against them. Of course any additions already made to the sums assured will have to be included, and due notice must be taken of any reduction in the original premium; and on this as well as on other accounts, it is better to have fresh lists at each valuation, and not a species of debtor and creditor account in which the number of existing Assurances is found after deducting the terminated ones. It is not necessary to take note of premiums being payable half-yearly or quarterly; the equivalent annual premium may safely be substituted in each case. To pursue a different course would render the classification of such assurances impracticable, whilst no advantage would accrue from the separate estimate of their value.

It may be well to mention here, too, that where an extra charge has been made for any deterioration in health, the corresponding age should always be considered as the true one, and the life classed accordingly. Where the extra charge is on account of residence abroad or for sea risk, it must be discarded and treated separately. If the extra charge be one in accordance with Tables specially made for any given climate, as is now generally the case with Indian risks, the assurance itself will come under a different class altogether, and must of course be omitted, to be valued eventually on the same principles as regards the foreign mortality as those adopted in reference to the native.

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* If the time of valuation be not *at* the 30th June, but the 30th Oct., for instance, then regard must be had to the financial, and not the civil year; so that one born any time in 1801, before the 30th April, must be considered as born in 1800—and so on.

We have hitherto left it to be inferred that the premiums actually receivable by the Society are those to be entered in the lists; and for reasons which will appear, it is desirable that they should be, but it is not essential. The all-important point is the entry of a true premium, corresponding in each particular with the actual one. This operation may be rendered very simple by the previous preparation of a Table exhibiting the amount of premium at the true rate for £100, £200, £300, &c., so that mere inspection will enable any one to make the entries from it—omitting then such accessories as different computers may think it desirable to have, the lists will present the following appearance:—

BORN IN THE YEAR .....

Number of Policy.	Sum Assured, and Bonus.	Premium Receivable.	True Premium.
	£. s. d.	£. s. d.	£. s. d.

The entries being completed and the total of each of the last three columns carefully determined, the means are at hand for obtaining the required result. Let us call the total sum assured and additions S, the total premium receivable P, and the total true premium P′; and let us denote the value, according to the true Table, of £1 payable at decease of any given life aged x years, by V_x, and the value of an annuity of £1 on such a life according to the same Table by A_x.

Then $S.V_x =$ True value of the sums assured and additions in each class,

$P'(A_x + .5) =$ Value of true premiums,

$S.V_x - P'(A_x + .5) =$ Liability,

$(P - P')(A_x + .5) =$ Fund set apart for future surplus and expenses,

x in every case being equal to the difference between the year of valuation and that of birth. The addition is made of half unity to the value of the annuity in consideration of the premiums being one with another all due within six months from the time of the valuation; and although this may appear to be a somewhat loose approximation, we are satisfied it will be found abundantly near enough to the truth for all practical purposes. Indeed, as in the former case which we have alluded to, we believe the result, even though not more than half a dozen entries occur in the class, will be identical with that produced by a valuation of each Assurance in which the falling due of the premiums in different months of the year is taken into account.

If claims are payable sooner than at the expiration of six months from the day of death, the value of $S.V_x$ will have to be increased accordingly; but the interval of three months usually stipulated for, is generally much exceeded in practice.

We have said that although it was not essential to ascertain P, the amount of the annual premiums actually receivable, it was very desirable to have it. The only use hitherto made of it, as will be observed, has been to shew the value of the marginal additions to the true premiums. It is useful, however, in some other respects. If the premium charged correspond with the true premium increased by a per centage; then $(P - \overset{\prime}{P})(A_x + .5)$ ought to be that same per centage on $\overset{\prime}{P}(A_x + .5)$, and thus a useful check is obtained. It may sometimes happen, too, when this per centage is unusually high, that it is considered proper to divide some portion of it, in order, it may be, to counterbalance any extraordinary fluctuation. In such a case it is only necessary to determine to what extent the future premiums shall remain "loaded," and the amount which may be anticipated is at once arrived at. Let us suppose, for instance, that $(P - \overset{\prime}{P})(A_x + .5)$ is equal to 40 per cent. upon $\overset{\prime}{P}(A_x + .5)$, and that it is thought advisable, under particular circumstances, to anticipate a portion of this fund—leaving a loading of not less than thirty per cent. to provide for future contingencies—here, then, we know immediately that one-fourth of $(P - \overset{\prime}{P})(A_x + .5)$ may be divided, and that the prescribed provision for the future still remains untouched.

We should have mentioned that, as regards Assurances not susceptible of classification—such as those on an increasing scale, on two or more lives, or for terms—the same principles may be adhered to; that is to say, the several lives may all be considered as being born on the day of the year at which the valuation is made, and the annual premium assumed to be due at the end of six months from that time; for it will be obvious that the average will still obtain; and it must be remembered that the object in view is to determine the liability and surplus merely, and not the share of the several contributors in the last mentioned quantity, that being ascertained by an entirely independent process.

Having, then, found the true value of the total sum assured and that of the premium payable in respect of it, the exact liability of the company will be apparent; and this contrasted with the assets will, of course, indicate the amount of surplus to be divided.

In determining the value of the several items which constitute the assets, it is not desirable, in general, to make any alteration in the original cost of the security, for it must be remembered that the interest which they have yielded on the average *has been fixed upon as the true rate.* I need hardly mention that due allowance must be made where the annual proceeds are of a terminable character. It is by no means expedient to increase the value of a security which yields a high rate of interest; that circumstance implies that there are hazardous features in it, and the extra rate can only be properly looked upon as a provision against them, and not as constituting an increased value. In like manner due care must be taken that all property of a contingent nature be made absolute; an Assurance Company cannot treat assets of this character as a Reversionary one can—nor, indeed, would it purchase them on the same terms.

The surplus, then, being satisfactorily ascertained, it appears only consistent with justice and propriety that it or its value, as exactly as possible, should be returned to the contributors. The practice of reserving a part of it seems to be unnecessary, for there is not only the excess included in the future premiums, but very generally a subscribed capital to fall back upon, beside the fund reserved for the liability. The surplus is the property of the contributors of that day, and the complication of interests which must arise from the keeping back any part of it is carefully to be avoided. In short, the main object of the periodical adjustments made by Life Assurance Companies is, the return of what has been overpaid *to those who have contributed to the excess.* The living during the interval, terminated at a given valuation, are the persons naturally entitled to participate in the success or non-success of that particular interval; and the adjustment of their several interests being once made, ought not, on any account, to be subsequently disturbed. These are plain deductions from considering this system of Life Assurance as based upon an agreement that all the parties concerned shall be secured in the payment of a given sum at death, whenever that may happen, and *that the contributions required from them for that purpose shall be the least possible*—a system which places a well-defined and proper limit to the extreme aberrations commonly occurring in all cases of average, and which is probably as well arranged as the nature of the circumstances will admit.

Having, then, determined the amount to be divided amongst the members of the Society, we have next to consider what portion of it belongs to each of them, or, in other words, in what degree have they severally contributed towards it. A little reflection will suffice to show that the surplus has arisen from the payments of that part of the premium charged which is in excess of the true premium, *for the amount of this last at the true rate of interest will necessarily constitute the liability at any given time.* Supposing, then, no expenses to have been incurred, the surplus will be exactly equal to the above-mentioned payments improved at the true rate of interest, and all that we have to do is to parcel out the total surplus in the proportion in which each member has thus contributed to form it; but expenses there must, of course, always be, and the real surplus will in consequence be much less than the supposititious one. Under such circumstances the nearest approach we can make to the truth will be the diminishing of each share of the surplus in the proportion which the actual surplus bears to the supposititious one, or, in other words, charging each of the contributors with a proportionate share of the total expenses. This is liable to some objection if all have not been members for the same period; but on the whole it appears, as we have elsewhere shown, to adjust the interests of each as fairly as is practicable. Probably the most convenient arrangement for effecting the required calculations is to have a volume of the proper thickness, one page being devoted to each Assurance, and the details being somewhat after the following fashion:—

N° ...... Sum assured, and Bonus .... £. ,, ,, ,,

Actual Annual Premium .... £. ,, ,, ,,
True ditto ditto .... £. ,, ,, ,,

Difference (ϕ) .... £. ,, ,, ,,

Logarithm of ditto ....

Years. Months.
Date of valuation .... — —
Ditto of first payment of Premium since previous valuation .... — —

Log. amount of £1 per annum in.............. — — . . . . . .

Log. supposititious share of surplus (ϕa^n) ....
Log. fraction $\frac{S}{\int_\bullet \phi a^n}$ ....

Log. real share ditto .... £. ,, ,, ,, ...

The remaining space in the page being left for the calculation of the equivalent reversion, reduction in premium, &c. &c., to be hereafter described. By S in the foregoing arrangement is meant the actual surplus, and by $\int_\bullet \phi a^n$ the amount of the supposititious one, formed from the payments of ϕ. (that is the difference between the premium charged and the true premium) improved at the true rate of interest. The share of each member is thus found from the ratio—

$\int_\bullet \phi a^n : S :: \phi a^n : \frac{S}{\int_\bullet \phi a^n} \times \phi a^n$. and as the fraction here is a constant quantity and a Table can be easily formed of the logarithms of the amount of £1 per annum paid in advance, in the number of months (usually not more than 60) entering into the calculation, the operation is very readily performed by the simple addition of the logarithms of the several quantities in question.

It will be obvious that before the value of the real share of surplus can be obtained the total amount of the supposititious shares must be determined, and for this purpose the results found in the foregoing statement will have to be tabulated after the following manner as the work proceeds:—

Num. of Policy.	Suppos. Share (ϕa^n)	Real Share $\left(\frac{s}{f.\phi a^n}\times\phi a^n\right)$			

The second column being completed before the third can be commenced. The remaining vacant columns will serve for the results connected with the allotment of the shares to the assured, the details of which we propose to discuss in our next number.

Mortality amongst Lives selected at the Ages 75 *to* 81, *for Government Annuities.*

We have already stated that we are indebted for a preceding paper in this number of our *Magazine*, to the kindness of Mr. W. T. Thomson, the eminent Actuary of Edinburgh; and we have now, in addition, to draw the attention of our readers to a few facts with which he has obligingly furnished us, respecting the selection of lives for Government Annuities, at an advanced age, which forms an interesting subject of enquiry. Although few in number, yet from the care with which the observations have been made, and the authenticity of the data, they are well worthy of attention. To afford greater facility of reference, we have classified them into the following Table.

Table showing, out of 83 Lives, selected at the Ages 75 to 81; the deaths in different years, and the number of survivors.

Selected at Age	75.		76.		77.		78.		79.		80.		81.		Total.	
YEARS.	Living.	Died.	Living.	Died.	Living.	Died.	Living.	Died.	Living.	Died.	Living.	Died.	Living.	Died.	Living.	Died.
1834	3	..	5	1	9	1	16	2	23	6	24	4	3	..	83	14
1835	3	..	4	..	8	..	14	1	17	1	20	1	3	..	69	3
1836	3	1	4	..	8	2	13	1	16	2	19	2	3	..	66	8
1837	2	..	4	..	6	..	12	1	14	..	17	1	3	..	58	2
1838	2	..	4	..	6	1	11	1	14	2	16	3	3	..	56	7
1839	2	..	4	..	5	3	10	1	12	1	13	1	3	..	49	6
1840	2	1	4	..	2	..	9	1	11	..	12	1	3	1	43	4
1841	1	1	4	1	2	..	8	1	11	3	11	1	2	..	39	7
1842	..	..	3	..	2	1	7	..	8	1	10	3	2	2	32	7
1843	..	..	3	..	1	..	7	1	7	2	7	2	..	..	25	5
1844	..	..	3	..	1	..	6	3	5	1	5	1	..	..	20	5
1845	..	..	3	..	1	..	3	..	4	2	4	2	..	..	15	4
1846	..	..	3	1	1	1	3	2	2	..	2	1	..	..	11	5
1847	..	..	2	1	..	..	1	..	2	1	1	1	..	..	6	3
1848	..	..	1	..	..	..	1	..	1	..	..	..	..	..	3	1
Surviving to 1849	..	..	1	..	..	..	..	..	1	..	..	..	..	..	2	
	18	3	51	4	52	9	121	16	147	22	161	24	25	3	575	81

The individuals chosen were all males, selected about the end of the year 1833, and the beginning of 1834, for four different investments.

1. 3rd July, 1833, 20 lives.
2. 9th Oct., 1833, 20 lives.
3. 3rd Jan., 1834, 20 lives.
4. 31st March, 1834, 35 lives.

95 lives.

Some of the lives were selected twice, which will account for the difference from the number given in the Table. Out of the number chosen previous to the 1st of January, 1834, one death occurred in the year 1833; but it is considered sufficiently near for any practical purpose to exclude the lives and the mortality for that year; and to assume that all the lives were brought under observation from the 1st of January, 1834, at the ages given at the head of the Table. From the data there recorded, all of the same age at the beginning of each year, have been brought together; and the probability of surviving a year at each age ascertained. Thus, the three who were selected at 81 are classed with the 20 surviving at that age, out of the 24 who had been selected at age 80, and with the 16 surviving to age 81, out of the 23 who entered at age 79, &c. The observations would otherwise not have been sufficient to form a Table of Mortality. A small Table, showing the number surviving at each succeeding age, out of 1000 existing at age 76, will be found below; and the Expectation thence deduced, compared with the Expectation according to Mr. Finlaison's Table of Government Male Annuitants, and that obtained from the Experience of 17 Life Assurance Companies, as published with the series of Tables computed by Mr. Jenkin Jones in 1843.

AGE.	Log. of the Probability of living a year.	Surviving at each Age.	Expectation.	Ditto, Government Males.	Ditto, Experience of Offices.
76	$\bar{1}$·94201	1000	6·88	6·69	6·11
77	·94201	875	6·79	6·23	5·76
78	·97004	766	6·68	5·78	5·42
79	·91568	715	6·12	5·35	5·09
80	·95861	588	6·34	4·94	4·78
81	·95653	535	5·92	4·55	4·48
82	·94310	484	5·49	4·18	4·18
83	·95424	425	5·18	3·82	3·90
84	·94885	382	4·70	3·46	3 63
85	·96614	340	4·22	3·12	3·36
86	·95031	314	3·58	2·81	3·10
87	·94389	280	2·90	2·53	2·84
88	·83863	246	2·23	2·31	2·59
89	·81291	170	2 01	2·12	2·35
90	·78915	110	1·83	1 95	2·11
91	·85387	68	1·65	1 83	1·89
92	·60206	49	1·09	1·65	1·67
93	·69897	19	1·03	1·49	1·47
94	....	10	·50	1·34	1·28

It may be remarked, that from the facts not being very numerous, we have thought it unnecessary to give a greater show of regularity to the probabilities of living by adopting any mode of arbitrary correction, and in the first three or four ages the numbers originally selected were very small. Allowance must be made for this in comparing the Expectation with the other two Tables. To facilitate the enquiries of those, however, who may feel disposed to form a more perfect Table, we have added the logarithm of the probability of living a year at each age. The average duration of life, according to the facts now recorded, will be noticed at every age up to 87, to exceed considerably either that according to the Government Table, or that derived from the Experience of Life Assurance Companies, and proves that a very profitable investment must have been the result of the Selection. In the case of 57 out of 81 deaths, the months are recorded in which the parties died, and it may be useful to compare, as in the following Table, what period of the year is most fatal at that advanced period of life.

Out of 57 Deaths, there occurred in different Months :—

January ..	2	April ..	4	July	4	October .	10
February ..	6	May...	4	August .	3	November	6
March	5	June ..	5	Septembr.	5	December	3
Proportion per cent.	22·81		22·81		21·05		33.33

On the Fires in London during the 17 *years from* 1833 *to* 1849 *inclusive, showing the numbers which occurred in different trades, and the principal causes by which they were occasioned.* By SAMUEL BROWN, Esq., Fellow of the Institute of Actuaries.

UNTIL within a very recent period the doctrines of probability have been applied to scarcely any great public purpose except the Assurance of human life. In that particular department of knowledge, a number of labourers have been for many years busily occupied in gathering the facts, endeavouring to classify events, and trace some general laws. In later years, researches have been extended into the effects of different classes of diseases upon health and longevity. Still more recently, the calculations of fidelity risks, of railway and other accidents, of bankruptcy, and of other circumstances affecting the person of an individual, or his commercial dealings, have been made with a view of proving their capability of being estimated for Insurance.

It is remarkable that, in the midst of all these enquiries, the classes of Insurance for which England first became famous, and which, in fact, by their early success, led to the still more extraordinary progress which has distinguished the system of Life Assurance, viz., Fire and

Marine Risks, have been almost wholly neglected as matters of statistical research. It is not, by this remark, intended to convey an impression that the system on which the Fire Insurance Offices are conducted, is in the least degree deficient in that experience on which such important affairs must mainly depend, or that the skill of the managers is inferior to that which is required in the business of Life Assurance. On the contrary, the remarkable success, and the stability of those great Companies, and the enormous amount of property which has been secured from risk by their means in this kingdom—to say nothing of the Foreign Assurances, which their honourable dealing and their guarantee of accumulated wealth have attracted, are the best proofs of the sagacity and experience of those who have so creditably managed their transactions. But, whilst the facts connected with the Assurance of Life have been recorded and published, and whilst they have thus led the way to many new and important applications of the doctrine of Probability, those of Fire and Marine Insurance have never been made public. The immense collection of data which must have been gathering for upwards of 130 years, in the books of some of the older Companies, would present many very curious results, both as to the actual facts regarding the frequency and the extent of damage by fire, as well as to the changes in the values of property of various kinds in all parts of the kingdom. They would serve to indicate, also, the gradually improving condition of the public mind, by the increasing desire of the people to avail themselves of the advantages offered by the system of Insurance. The effect of these admirable associations in preserving the stability of our institutions, by the interest which they give, even to the labouring classes, in the defence of order against anarchy, and prudent but gradual improvements against reckless innovations, have scarcely yet been sufficiently appreciated. It may be too much to expect that private companies should make their affairs public for the sake of any vague and undefined good which the speculator may deem will result to general science, or political economy, by the knowledge which they have acquired in the way of business, and which is exclusively their own. It is probable, however, that not only would no injury result to the companies from the publication of their experience; but, on the contrary, the greater satisfaction and confidence of the public would amply repay the trouble and expense, whilst a vast and novel field of observation would be open to the enquirer.

The skill and judgment which has hitherto distinguished the managers of that class of business in the selection of the risk, so far from being rendered valueless by the general conclusions drawn from a comparison of events, would be more than ever appreciated by the insured, from their perceiving the difficulty of classifying the risks under their proper heads, and the study and attention which must be given to attain success. Not only would curious information be afforded, but some observations of great utility to the public probably secured. Thus, the proportion of fires, according to the different trades, would exhibit the greater or less hazard with which various occupations are attended from this cause; and if the causes were stated in each division, attention would be directed so as to ascertain what dangers were inherent in the nature of the business, and what might arise from circumstances capable of being remedied, and the risks diminished. Most of these facts are, no doubt, already known to those connected with Insurance Companies, whose business it is occasionally to compare them. But it does not fall within the scope of their duty to warn the public of consequences; and till these are forced upon the notice of the public, or of authorities competent to interfere, no remedy will be proposed, and no correction applied.

The data which may be found in the records of the Fire Insurance Companies, are, (similar to those of Life Insurance Companies with regard to human life) the most perfect that can be obtained. They possess, however, one great advantage, that a very few years serve to form a sufficient average, since their progress can be observed from year to year, whereas in the latter the whole duration of life of all the individuals existing at a given time, must be followed out to allow of any sound conclusions being drawn from the observations. I sincerely hope that the growing spirit of enquiry will induce many of those who so thoroughly understand the subject, now feebly touched upon, to draw together such observations as can be relied upon, and favour the public with a more perfect collection of data than can at present be offered. No one can deny the vast importance of the enquiry. The amount of property insured against fire in 1848 was £811,000,000; and the nominal capital subscribed to guarantee the due fulfilment of these engagements at the end of 1849, was computed at more than £50,000,000, by 59 Companies; some of them, however, guaranteeing under the same capital, also life and maritime risks.

Within the last few years different accounts have been given of the fires in London; but they will be found on examination all to be drawn from the same source, the excellent Reports of Mr. Braidwood, the Superintendent of the Metropolitan Fire Brigade, to the Committee for Managing the London Fire Engine Establishment. Mr. Baddeley, Civil Engineer, has for many years given most interesting Reports in the "Mechanic's Magazine," embracing not only the substance of the facts detailed in Mr. Braidwood's Reports, but a general narrative of the fires which have occurred in the year; and which have excited particular interest either from the magnitude of the losses, the destruction of human life attending them, or the unusual incidents which have made them notorious. He has also taken the opportunity of offering the most valuable suggestions, which his experience and practical acquaintance with the subject entitle to the highest respect, as to the points to which the attention of the public or of the authorities should be directed. In the "Statistical Journal" for 1838, will be found a general account of the formation of the London Fire Engine Establishment, which may be referred to for a general summary of the constitution and organization of this useful force. The same paper contains a summary of all the fires which occurred in the years 1833 to 1837 inclusive, within the range to which these engines can proceed, extending to places even 10 or 15 miles distant from London. The proportion of "Wholly Consumed," "Seriously Damaged," and "Slightly Damaged;" the proportion in each month, in each day of the week, and in each hour of the day. A list of the occupations in premises, in which more than six fires occurred during the above five years; of the causes generally which lead to those fires, and the causes also distinguished in some of the trades, in which more than 20 fires occurred in the period, and the proportion of Insured and Uninsured. These Tables present at one view many of the leading deductions from the facts at that time recorded. In the volume of the same Journal for 1844, p. 361, may be seen Mr. Braidwood's Report for 1842, and a general abstract of the fires which have occurred in London during the ten years 1833 to 1842 inclusive. In the next succeeding volume the list of fires for that period is given for every occupation (180 in number), with the causes in each, so far as they could be ascertained; the total number of fires recorded being 7499. In a very useful little book by Mr. Hillman, entitled "Familiar Illustrations of the Theory and Practice of Assurance," the facts contained in Mr. Baddeley's Reports from 1836 to 1845, are brought together, and the averages deduced to illustrate "The Theory of Probabilities," and the small deviation which occurs from the average even in a class of facts, which would appear at first sight to be so little under the control of general laws. As in the first number of the "Statistical Journal," he compares them also under the arrangement of months and days, occupations, and causes. He applies also the experience of the actual facts to the total number of dwellings which are stated in the London Directory to be occupied by individuals of different trades. This is an important point in showing the relative liability to fires of various employments and their greater or less degree of hazard from fire. It can only be deemed a rough approximation; but unfortunately must remain the nearest approach we can make to correctness, until the Insurance Companies, which possess the most complete, we might almost say the only perfect data for forming this comparison, shall have given to the public the results of their experience.

In presenting to the reader a continuation of the Tables which have been before enumerated, and which are still derived from the same authentic sources, the Reports of Mr. Braidwood from 1843 to 1849, I gladly take the opportunity to express my deep obligations to my friend Mr. W. M. Browne, of the Westminster Fire Office, both for the use of the papers from which the facts have been collected, and for the kind assistance which I have derived from his long tried experience and valuable advice on this as well as on former occasions. The Annual reports of Mr. Baddeley, which have been continued from year to year in the "Mechanics' Magazine" up to the same date, have been freely used. I can only regret that, though interesting in themselves, the conclusions to be drawn from the Tables must still be imperfect, without a more accurate account of the numbers in each class of occupation, and the progress of new buildings from year to year in the precise range within which the fires occurred. It is evident, that as the buildings within ten miles of London increase, the fires also may be expected to increase; but, whether the proportion is greater or less than in former years, is a question which depends upon both classes of facts being accurately known. It appears reasonable also to suppose that though the buildings may increase rapidly in villages and towns at the extreme distance from London (from 10 to 15 miles) at which the engines have any chance of arriving before the premises are consumed, the fires may increase in faster proportion than the buildings, for want of the organised establishments at hand, which, in London itself, may afford such prompt and efficacious assistance. Could not the railroads, the completion of which has certainly tended to add to the buildings at that distance from London, be organized to offer their aid by transmitting intelligence through their electric lines, and having a special fire engine, capable of being easily transferred from the rail to the road, always ready to proceed to the nearest station with a part of the London force for the scene of action. Had the project once entertained of uniting all the lines of railway in a circle about ten miles from the metropolis ever been completed, what remarkable facilities might have been afforded in protecting the growing suburbs from the fearful calamities of fire, as well as the other dangers to which property and life are exposed?

Comparison of Fires, and damage caused by fire, in different periods.—To proceed, however, to the facts contained in Mr. Braidwood's Reports, the following Table will be found to comprise all the observations recorded under these heads, for the 17 years from 1833 to 1849 inclusive; the first 15 subdivided into periods of five years to allow of a comparison being made in each period.

TABLE I.

Statement of Fires and alarms of fire in London and the vicinity for 17 years, 1833 to 1849 inclusive.

YEAR.	Totally destroyed.	Considerably damaged.	Slightly damaged.	Gas.	No Gas.	Total Fires.	False Alarms.	Chimney Alarms.	Total Alarms.	Total of Fires and Alarms.
1833	31	135	292	96	362	458	59	75	134	592
1834	28	116	338	130	352	482	57	112	169	651
1835	31	125	315	172	299	471	66	106	172	643
1836	33	134	397	195	369	564	66	126	192	756
1837	22	122	357	203	298	501	82	134	216	717
	145	632	1699	796	1680	2476	330	553	883	3359
1838	33	152	383	228	340	568	79	108	187	755
1839	17	165	402	250	334	584	70	101	171	755
1840	26	204	451	236	445	681	84	98	182	863
1841	24	234	438	300	396	696	67	92	159	855
1842	24	224	521	331	438	769	61	82	143	912
	124	979	2195	1345	1953	3298	361	481	842	4140
1843	29	231	489	311	438	749	79	83	162	911
1844	23	237	502	322	440	762	70	94	164	926
1845	23	253	431	307	400	707	81	87	168	875
1846	25	233	576	388	446	834	119	69	188	1022
1847	27	273	536	411	425	836	88	66	154	990
	127	1237	2534	1739	2149	3888	437	399	836	4724
1848	27	269	509	447	358	805	120	86	206	1011
1849	28	228	582	418	420	838	76	89	165	1003
	55	497	1091	865	778	1643	196	175	371	2014
TOTAL. 17 years	451	3335	7519	4745	6560	11,305	1324	1608	2932	14,237

It will thus be seen that the total number of alarms of fires which have been attended by the engines of the establishment in the whole period, was 14,237; but of this number, the total number of false alarms was 1324, and the large number of 2932 were chimney alarms, leaving 11,305 which come under the designation of fires, or an average of 665 every year. The proportion of alarms given does not differ much from the average in any of the periods, as will appear by the following Table, although if we take into account the increase in the number of buildings, it may be considered rather less in recent than in the earlier periods. With regard, however, to alarms which prove to be only from fires arising in chimneys, the diminution is considerable from the first to the last period, and would seem to indicate either that a greater degree of carefulness prevails, or that the inmates of houses were more careful in extinguishing fire in this early stage;—in either view, a satisfactory conclusion to arrive at.

TABLE II.

Showing the proportion per cent. of total calls for fires.

	Alarms.	Chimney Alarms.
1833-7	9·82	16·45
1838-42	8·72	11·62
1843-7	9·25	8·45
1848-9	9·73	8·69

The average number of fires has been steadily increasing in each of the quinquennial periods, as will appear by the following.

TABLE III.

Showing the average number of fires, and the proportion per cent. in each period.

YEARS.	Average Number of Fires per Year.	Per Cent.
1833 to 7	495·2	17·98
1838 to 42 ..	659·75	23·95
1843 to 7	777·6	28·24
1848-9	821·5	29·83
	2754·05	100·

The last period consists only of two years; but it still shows an increase on the preceding period of five years. The question however remains open, whether this increase is more rapid than that of buildings in the metropolitan districts in the same periods. A more curious Table is that of the comparison of damages, and the periods are compared under the three heads as below.

TABLE IV.

Showing the proportion per cent. of buildings destroyed, or partially destroyed, by fire.

	Proportion per Cent.				
	1833-7.	1838-42.	1843-7.	1848-9.	Total. 1833-49.
Totally destroyed ..	5·85	3·76	3·27	3·35	3·99
Seriously damaged..	25·53	29·68	31·56	30·25	29.50
Slightly damaged ..	68·62	66 56	65·17	66·40	66·51
	100·	100·	160·	100·	100·

From which comparison it may be inferred, that in a long period of years the proportion "totally destroyed" would be about 4 per cent.; "seriously damaged" 29½ per cent.—together 33½ per cent.; and "slightly damaged" 66½ per cent. For the ten years, from 1836 to 1845, Mr. Hillman, distinguishing them under the heads of total, half, and quarter losses, gives these proportions respectively as 4·4, 29·4, and 66·2 per cent.—a very slight difference. It will be noticed also, that the number "totally destroyed" has been gradually diminishing till the last period.

Increased use of Gas.—The facts given in the Reports also allow of a comparison being made of the proportion of buildings in which gas was employed or not. The increased consumption of gas is very rapid, especially within the last two years; and it is evident from the result, that if danger may be apprehended from the employment of this valuable medium of producing light, that the danger cannot be perceived to have increased with the more extensive use made of it.

TABLE V.

Showing the increased consumption of gas in the several periods.

	Proportion per cent. of Fires in which Gas was found to be used on the Premises.	Of 100 Buildings in which Gas was consumed. Proportion per cent. in each period.
1833-7	32·15	18·88
1838-42	40·78	23·95
1843-7	44·73	26·26
1848-9	52·65	30·91
Total average, 1833-49 ...	41·97	100·

By comparing the second column with the second column of Table III, it will be noticed, that whilst the use of gas has increased from 19 in the first to 31 per cent. in the last period, the increase in the proportion of the number of fires has not been more than from 18 to 30 in the same time. In the 7th vol. of the Statistical Journal, it is stated, that in the first 10 years above recorded the proportion of cases of fire, in which gas was found to be used on the premises, had increased from one fourth at the beginning to three fourths of the whole number of fires at the end of the 10 years. The writer appears to have fallen into a slight error, having compared the former with the fires in which no gas was found to be used on the premises, instead of the whole number of fires. The total number of fires attributed to various accidents from gas were, in the first 10 years, 413 out of 2141 buildings in which it was used, or 19·3 per cent. In the last seven years, they were 364 in 2604 buildings, in which gas was consumed, or only 14 per cent.

Fires in different Months.—The regularity with which the fires have occurred in different months of the year, is shown by the following Table, in which it has been considered sufficient to give the summary of the 10 years from 1833 to 1842, compared with those from 1843 to 1849 inclusive; this being the division followed subsequently in the classification of trades. Though January and December comprise together, as might be expected, a larger proportion than any other two following months, yet the difference between the winter and summer months is very small. The proportions from April to September inclusive, in the former period, are 49·06 per cent. of the fires in the whole year; and in the latter period, 49·26 per cent.; showing by their close correspondence, how well we may rely on observations extending over a sufficient number of years.

TABLE VI.

Showing the proportion of fires which happen in each month of the year.

MONTH.	Total Fires 1833 to 1842.	Proportion per cent.	Total Fires 1843 to 1849.	Proportion per cent.
January	502	8·69	505	9·13
February	452	7·83	437	7·90
March	496	8·59	449	8·12
April	429	7·43	399	7·21
May	485	8·40	465	8·41
June	474	8·21	446	8·06
July	467	8·09	457	8·26
August	532	9·21	481	8·70
September	446	7·72	477	8·62
October	471	8·16	429	7·77
November	500	8·66	443	8·01
December	520	9·01	543	9·81
	5774	100·	5531	100·

Fires on different days of the Week.—The proportions of fires happening on the various days of the week, approach very closely to the average to be expected. The only circumstance worthy of remark, appears to be the large proportion of fires occurring on a Sunday, when it might be supposed that numbers of workshops, and those portions of a building in which trades are carried on, would by the cessation from labour, have a respite also from the chances of so fearful a calamity. Yet the proportion, in each of the periods, falls very little short of any of the other days of the week. The explanation appears to be, that in many small private houses and in manufactures, where it is necessary to keep up the fires till work is resumed, the attendance is more negligent; and a fire having smouldered without observation through the whole of the Sabbath, bursts forth before attention has been drawn to it. Some of the most extensive fires which have occurred, have happened on the Sunday evening or early on Monday.

TABLE VII.

Showing the proportion of fires which have occurred on various days of the week.

DAYS.	Total Fires 1834 to 1842.	Proportion per cent.	Total Fires 1843 to 1849.	Proportion per cent.
Monday	760	14·30	773	13·98
Tuesday	805	15·14	792	14·32
Wednesday ..	781	14·69	785	14·19
Thursday	755	14·20	812	14·68
Friday	742	13·96	762	13·78
Saturday	742	13·96	826	14·93
Sunday. . ..	731	13·75	781	14·12
	5316	100·	5531	100·

In the above Table, the fires on days of the week for the year 1833 not being given in Mr. Baddeley's Reports, the nine years previous to 1843 are compared with the seven following years. The numbers are sufficiently near in each period to have shown any peculiarity that might exist; but there seems nothing that requires comment beyond the large number of fires occurring on Sunday, as noticed above.

Fires at different hours of the Day.—A very remarkable regularity exists in the proportion of fires at the different hours of the day. In the following Table, the proportion may not only be compared as to the hours at which they occurred, but as to the change which has taken place in the two periods 1833 to 1842, and 1843 to 1849. Those who are curious on the subject will also find in the first vol. of the Statistical Journal, p. 291, a similar comparison for the years 1833 to 1837 only. The minimum number of fires occurred in all the three periods from five to nine in the morning. The proportion for the 10 years 1833 to 1842, does not differ much from the first five years of the period, being 10·37 in the former and 10·46 in the latter; but there is a diminution at these hours in the seven years 1843 to 1849, which is only 9·82 per cent. The diminution is still greater in the last period from 9 a.m. to 4 p.m., being 17·43 per cent. compared with 21·19 per cent. in the 10 years, and 21·84 in the first five years only. The proportion continues to increase steadily at almost every hour, in all the three periods above-mentioned, from 9 a.m. till 10 p.m.; but the most rapid increase is from 5 p.m. to 2 a.m., in which nine hours 58 per cent. of all the fires occurred in the first 10, and 61 per cent. in the last seven years.

TABLE VIII.

Showing the proportion per cent. of fires which have occurred at different hours of the day and night.

HOUR.	Proportion per cent.		HOUR.	Proportion per cent.	
	1833 to 42	1843 to 9		1833 to 42	1843 to 9
A.M. 5th	2·25	2·80	P.M. 5th	3·55	3·71
6	2·23	1·90	6	4·36	4·41
7	1·73	1·77	7	5 73	5·93
8	2·20	1·72	8	7·27	6·80
9	1·96	1·63	9	8·11	7·86
10	2·58	1·90	10	8·15	9·56
11	2·68	2·68	11	7·46	8·19
12	2·79	2·46	12	6·17	6·47
P.M. 1	3·34	2·69	A.M. 1	5·54	6·40
2	3·43	2·42	2	5·21	5·32
3	3·15	2·37	3	3·41	4·63
4	3·22	2·91	4	3·48	3·47
	31·56	27·25		68·44	72·75

It will not fail to be observed, that in the last period there has been a great diminution of fires during the hours of daylight, and an increase during the night, which may possibly explain why the number totally destroyed and seriously damaged, added together, have not borne the much smaller proportion to the total number of fires, which might have been expected from the increased efficiency of the Fire Brigade, and facilities of prevention. During the night, it may be supposed, that causes of conflagration would smoulder unperceived, till the flames break out beyond the power of ready extinction. The proportion of totally destroyed and seriously damaged, compared with slightly damaged, in the two periods, are—

Proportion per cent. of Total Fires.

	1833 to 1842.	1843 to 1849.
Totally destroyed ..	4·66	3·29
Seriously damaged..	27·90	31·17
Together	32·56	34·46
Slightly damaged ..	67·44	65·54
	100·	100·

Proportion of Insurances against Fire.—We will now proceed to a Table, showing the proportions of Buildings and Contents on which insurances have been effected, as deduced from the facts given in Mr. Baddeley's Reports, from 1836 to 1849. I have subdivided them into a greater number of periods, in order to show the gradual though steady progress which has been made in the prudent feeling of all classes, to provide against the destruction of property by this fearful element.

TABLE IX.

Proportion per cent. of Insurances ascertained to have been effected in cases of fire.

	1836 to 7.	1838 to 42.	1843 to 7.	1848 to 9.	Whole Period. 1836 to 49.
Buildings and Contents	32·11	37·33	37·73	41·27	37·58
Buildings only........	11·27	14·37	16·23	17·22	15·24
Contents only	16·90	15·49	14·30	12·54	14·69
Neither	39·72	32·81	31·74	28·97	32·49
	100·	100·	100·	100.	100·

These particulars relate exclusively to property in which the fire originated, not comprising the cases in which damage was done to the contiguous premises.

Thus it appears that on the average of the whole period, 67½ per cent. have been insured in some way or other, and 32½ per cent. not insured at all, and that the proportion not insured at all has diminished from nearly 40 per cent. in the first period to 29 per cent. in the last; whilst of those who have had the prudence to insure both buildings and contents, the proportion has increased from 32 per cent. in the first, to upwards of 41 per cent. in the last period. Even the gradual increase of the "buildings only" insured, compared with the diminution of "contents only" insured, is probably a favourable feature, since buildings may, in most cases, be presumed to require larger insurances than the contents, except in the case of some particular trades. This is a question, however, which though interesting to the political economist in estimating the increasing wealth or prudent habits of the people, can only be answered by the Insurance Companies, from the combination of facts, which I fear it will be some time before we can expect they will be brought together, or the results made public. The proportions given above are deduced from the reports of the fires, as stated above, only as regards the buildings in which they commenced. In the year 1841, a more careful inquiry was instituted, and all the cases in which either property in houses or their contents were damaged by fire were enumerated. Only 12 cases in 2136 remained unknown, the following is the result:—

In 1841.	Insured.	Not Insured.	Unknown.	Total.	Proportion Insured per cent.
Buildings .	914	197	10	1121	81·53
Contents . .	609	404	2	1015	60·
	1523	601	12	2136	71·30

It thus appears that 81½ per cent. of the number of "buildings" were insured, and 60 per cent. of the "contents"; and of either one or the other, out of the total cases of damages by fire reported, about 71⅓ per cent., leaving 29⅔ per cent. wholly uninsured. This differs nearly 3 per cent. from the averages deduced in the former Table, and may probably, from the greater care exercised, be taken as a correction, though only the result of a single year. It does not touch, however, the important question, what proportion of the *value* of a property remains on an average uninsured.

Proportion of Fires in different Trades and Occupations.—This portion of the subject, though a curious and interesting branch of enquiry, must, in some degree, be left for future investigation, since we have endeavoured in vain to trace the proportion of houses occupied by different trades in the various parts of London and the environs, to which the operations of the Fire Brigade extend. The Registrar-General, in the census about to be taken in the ensuing year, will probably obtain a more perfect enumeration of the numbers of persons classified in various trades and occupations, than has ever before been made; and if the mortality in the previous and ensuing years can also be distinguished, some very remarkable deductions may be made on the effect of various occupations on the health and duration of life to persons engaged therein. If at the same time an account be taken of the number of houses in the metropolis and the environs, of the trades carried on in each, and of the locality, equally curious results might be exhibited as to the objects of our present enquiry. In the meantime, however, it will be sufficient to arrange all the facts hitherto collected as to fires in different trades in the two principal periods, which we have already pointed out as containing nearly an equal number of facts, there having been 5774 fires in the 10 years 1833 to 1842, and 5531 in the seven years 1843 to 1849. In the original Returns, the number of houses in which "gas" and "no gas" was used, is given for each trade; but as the general results of the use of gas have been already stated, and it does not appear that the employment of it depends much upon the nature of the occupation, I have not thought it necessary to subjoin the figures. The proportion of fires, however, in each trade, to the total numbers which have occurred, are given in each of the period, as stated in the following Table.

TABLE X.

Showing the number of Fires which occurred in London and its environs in the 10 years 1833 to 1842, and in the 7 years 1843 to 1849, in different Trades and Occupations.

	1833 to 1842.				1843 to 1848.			
	Totally destroyed.	Considerably damaged.	Slightly damaged.	Total.	Totally destroyed.	Considerably damaged.	Slightly damaged.	Total.
Apothecaries (no Chemical Works) .	1	10	8	19	- -	8	11	19
Archel-makers	- -	1	- -	1				
Asphalte Works	- -	1	1	2	- -	- -	1	1
Bagnios	- -	8	21	29	- -	9	26	35
Bacon Dryers	- -	- -	3	3	- -	1	3	4
Bakers	7	46	87	140	3	28	82	113
Do. Sea-biscuit ..	- -	2	1	3	1	2	1	4
Do. Muffins	- -	- -	1	1	- -	- -	3	3
Barge and Boat Builders	- -	5	6	11	- -	- -	6	6
Basket-makers ...	2	4	2	8	- -	2	3	5
Bath-keepers	- -	- -	1	1	- -	2	1	3
Baths & Washhouses	- -	- -	- -	- -	- -	1	- -	1
Beer-shops	3	9	20	32	1	22	41	64
Blacking-makers....	- -	1	1	2	- -	- -	2	2
Bleachers	- -	- -	- -	- -	- -	1	- -	1
Booksellers, Binders, and Stationers....	- -	40	39	79	- -	36	36	72
Bottle-merchants ..	- -	1	- -	1	- -	- -	2	2
Brewers	- -	8	5	13	1	2	4	7
Brickmakers	- -	- -	1	1	- -	1	- -	1
Bridges	- -	- -	- -	- -	- -	1	- -	1
Brokers and Dealers in Old Clothes....	3	23	22	48	1	23	25	49
Builders	2	1	8	11	8	15	16	39
Butchers	- -	1	1	2	- -	1	6	7
Cabinet-makers	15	39	30	84	7	45	39	91
Camphor-merchants.	- -	- -	- -	- -	- -	1	2	3
Caoutchouc-manufacturers	- -	5	2	7	1	1	2	4
Cane-dyers	- -	2	- -	2	- -	1	2	3
Carpenters and Workers in Wood (not Cabinet-makers)..	24	96	125	245	20	81	108	209
Carriers	1	1	- -	2	- -	- -	2	2
Cartgrease-makers ..	- -	1	- -	1	- -	1	1	2
Cement and Plaster of Paris Works ..	- -	2	- -	2				
Chandlers..........	6	16	26	48	2	31	46	79
Charcoal and Coke, Dealers in	- -	2	9	11	1	5	11	17
Cheesemongers	3	6	11	20	1	13	9	23
Chemists (including Chemical Laboratories)	2	18	20	40	- -	5	10	15
Chocolate-makers ..	- -	- -	1	1	- -	1	- -	1

	1833 to 1842.				1843 to 1848.			
	Totally destroyed.	Considerably damaged.	Slightly damaged.	Total.	Totally destroyed.	Considerably damaged.	Slightly damaged.	Total.
Churches	1	8	9	18	2	2	12	16
Cigar-makers	- -	3	1	4	- -	2	4	6
Coach-makers	5	7	13	25	1	9	8	18
Cochineal-dryers	- -	- -	1	1				
Coach-painters	1	- -	- -	1				
Coal-merchants	- -	- -	- -	- -	2	2	6	10
Cocoanut-fibre Manufacturers	- -	- -	- -	- -	- -	3	- -	3
Coffee-shops and Chop-houses	1	8	25	34	2	15	45	62
Coffee-roasters	- -	5	14	19	1	- -	8	9
Colour-makers (not mere Colour-shops)	- -	5	10	15	- -	8	4	7
Comb-makers	- -	1	- -	1				
Confectioners and Pastry-cooks	1	8	12	21	- -	9	15	24
Coopers	3	1	5	9	1	8	10	16
Cork-burners	1	1	3	5	- -	1	4	5
Cork-cutters	1	3	- -	4	- -	3	- -	3
Corn-chandlers	2	11	3	16	3	16	7	26
Corn-mills	- -	- -	1	1				
Cotton-wool, Workers in	1	2	3	6	- -	1	- -	1
Cotton-wick Manufacturers	- -	1	- -	1	- -	1	- -	1
„ Winders	- -	- -	- -	- -	- -	1	- -	1
Curriers and Leather-sellers	2	5	4	11	- -	7	9	16
Distillers	- -	13	7	20	- -	2	4	6
„ Herbs	- -	- -	- -	- -	- -	1	- -	1
„ Illicit	- -	3	3	6	- -	1	2	3
„ Naptha	- -	- -	- -	- -	- -	1	1	2
„ Tar	2	4	1	7	- -	2	1	3
„ Turpentine	- -	- -	- -	- -	1	1	2	4
Docks	- -	1	4	5	- -	3	3	6
Drapers (Woollen, Linen, & Mercers)	3	46	67	116	4	67	88	159
Druggists (Wholesale)	1	- -	- -	1	- -	2	4	6
Dry-salters	- -	1	3	4				
Dyers	- -	5	7	12	- -	3	6	9
Eating-houses	1	3	36	40	- -	6	28	34
Engineers (Mechanical)	- -	- -	- -	- -	1	6	5	12
Farming Stock	3	27	3	33	5	41	1	47
Feather-merchants	1	5	6	12	- -	4	4	8
Fell-mongers	1	1	1	3	- -	10	- -	10
Felt-makers	1	- -	1	2	- -	3	- -	3
Fire-preventive Company	- -	1	- -	1				
Firework-makers	4	10	6	20	2	20	10	32
Firewood (Patent) Manufacturers	- -	- -	- -	- -	- -	2	- -	2
Flax-makers	- -	1	6	7	2	1	4	7

	1833 to 1842.				1843 to 1848.			
	Totally destroyed.	Considerably damaged.	Slightly damaged.	Total.	Totally destroyed.	Considerably damaged.	Slightly damaged.	Total.
Floorcloth-manufacturers	1	2	1	4	4	2	1	7
Founders	- -	12	14	26	- -	6	10	16
French Fancy Warehouses	- -	- -	2	2	- -	1	2	3
Furriers and skin-dyers	2	4	3	9	1	12	11	24
Gaming-houses	- -	1	1	2	- -	- -	2	2
Gas-works	- -	7	18	25	- -	3	15	18
Glass and Emery Paper-makers	- -	1	- -	1	- -	2	1	3
„ Blowers	- -	- -	1	1	- -	2	3	5
„ Illicit	- -	2	3	5				
„ Benders	- -	1	- -	1				
Glue-makers	- -	1	1	2	- -	2	1	3
Granary-keepers	1	1	1	3	- -	1	- -	1
Grocers	7	23	29	59	5	42	22	69
Gunpowder, Sellers of	- -	1	- -	1				
Gunproof House	- -	- -	- -	- -	- -	1	- -	1
Hair-dressers (using ovens)	- -	- -	1	1				
Hat-makers	2	32	23	57	3	33	16	52
Hemp and Flax-merchants	1	2	- -	3	- -	2	- -	2
Horsehair-merchants	2	1	5	8	- -	3	1	4
Horse-slaughtermen	- -	- -	- -	- -	- -	1	- -	1
Hotels (including Club-houses)	- -	13	26	39	- -	10	34	44
Ink-makers	1	1	- -	2	- -	- -	1	1
Japanners	1	5	5	11	- -	6	3	9
Lampblack-makers	1	6	5	12	- -	3	1	4
Laundresses	1	6	8	15	- -	5	13	18
Leather (Patent) Makers	- -	2	3	5	- -	8	2	10
Limewharfs	- -	- -	1	1	- -	2	1	3
Linen-manufacturer	- -	- -	- -	- -	1	- -	- -	1
Livery Stables	- -	1	4	5				
Lodging Houses	2	66	372	440	- -	70	457	527
Lucifer Match-makers	- -	36	27	63	- -	23	18	41
Lunatic Asylums	- -	- -	- -	- -	- -	- -	2	2
Maltsters	1	4	1	6	1	1	2	4
Manchester Warehouses	- -	1	10	11	1	8	16	25
Manganese-manufacturers	- -	- -	1	1				
Marine Stores, Dealers in	2	7	14	23	2	7	20	29
Markets	- -	- -	- -	- -	1	- -	- -	1
Mattress-makers	- -	2	2	4	- -	2	4	6
Mast and Block-makers	1	- -	- -	1	1	1	- -	2
Millers	3	- -	- -	3				
„ Steam	- -	2	3	5	- -	2	- -	2

	1833 to 1842.				1843 to 1848.			
	Totally destroyed.	Considerably damaged.	Slightly damaged.	Total.	Totally destroyed.	Considerably damaged.	Slightly damaged.	Total.
Milliners and Dress-makers	- -	- -	- -	- -	- -	1	- -	1
Musical Instrument-makers	- -	6	4	10	2	14	6	22
Mustard-makers ...	- -	- -	1	1	- -	1	- -	1
Naptha-manufacturers	1	1	1	3	- -	1	- -	1
Nurserymen........	- -	- -	- -	- -	- -	1	1	2
Nuts, Dealers in....	- -	- -	2	2	- -	- -	3	3
Oil and Colour-men (not Colour-makers)	7	28	52	87	6	38	45	89
Oil and Preserve-merchants	1	- -	1	2				
Oil-refiners	- -	- -	1	1				
Oil-works	1	2	- -	3				
Painted Baize-makers	1	2	1	4	2	5	2	9
Painters, Plumbers, and Glaziers	1	4	8	13	- -	8	1	9
Panoramas	- -	- -	2	2				
Paper-hangers	1	- -	1	2				
„ Mills........	- -	3	1	4				
„ Stainers	- -	1	5	6	- -	4	4	8
Pasteboard-makers .	- -	- -	- -	- -	- -	2	- -	2
Pawnbrokers	3	8	6	17	1	7	3	11
Perfumers	- -	- -	1	1	- -	- -	1	1
Picture-dealers	- -	1	- -	1				
Pipe-makers	- -	1	3	4	- -	- -	2	2
Pitch-makers	- -	2	- -	2				
Playing-card-makers	- -	1	2	3	- -	1	1	2
Pork-butchers......	- -	- -	3	3	- -	4	3	7
Potteries	- -	- -	2	2	- -	2	1	3
Poulterers	- -	- -	- -	- -	- -	3	- -	3
Printers & Engravers	3	10	23	36	1	16	22	39
„ Copper-plate	- -	8	7	15	- -	3	3	6
„ Ink-makers.	1	3	- -	4	- -	1	- -	1
Prisons............	- -	2	2	4	- -	1	1	2
Private............	27	304	1604	1935	13	315	1321	1649
Public Buildings ..	5	5	13	23	- -	5	15	20
Public Places (not Theatres)........	- -	1	- -	1	- -	2	6	8
Rag-merchants .. .	1	10	10	21	1	5	5	11
Railways	- -	2	- -	2	2	4	14	20
Ribbon-drapers	- -	- -	1	1				
Rope-makers	- -	8	6	14	3	5	1	9
Sack-makers	- -	2	2	4	- -	2	3	5
Sail-makers........	1	- -	1	2	1	3	1	5
Sale Shops & Offices (no hazardous goods)	19	83	223	325	14	77	147	238
Saltpetre-refiners ..	- -	1	- -	1				
Saw-mills..........	3	6	6	15	4	13	8	25
Schools of Industry .	- -	- -	2	2	- -	1	2	3
Scum-boilers	- -	- -	- -	- -	1	- -	3	4
Ships	- -	18	19	37	1	15	32	48
„ Breakers	- -	- -	1	1				

	1833 to 1842.				1843 to 1848.			
	Totally destroyed.	Considerably damaged.	Slightly damaged.	Total.	Totally destroyed.	Considerably damaged.	Slightly damaged.	Total.
„ Builders	1	3	8	12	- -	2	4	6
„ Chandlers	- -	3	1	4	- -	2	- -	2
„ Steam	- -	6	10	16	- -	2	4	6
„ „ Builders .	- -	1	- -	1	- -	1	1	2
Shot-manufacturers .	- -	1	- -	1				
Silk-dressers	- -	- -	1	1				
„ winders	- -	- -	- -	- -	- -	1	- -	1
Snuff-mills	1	- -	- -	1				
Soda-water-makers .	- -	- -	- -	- -	- -	- -	1	1
Soot-merchants	- -	1	8	9	- -	- -	9	9
Spice-merchants	- -	- -	1	1				
Stables	11	43	59	113	2	38	56	96
Starch-makers	- -	3	- -	3	- -	5	1	6
Stay-makers	- -	- -	- -	- -	- -	2	3	5
Steam-boiler-makers	- -	4	- -	4				
„ Mills	1	- -	- -	1				
Straw-bonnet-makers	- -	1	4	5	- -	9	9	18
Sugar-refiners	3	4	4	11	1	3	2	6
Tailors	1	19	22	42	- -	25	27	52
Tallow - chandlers, Melters, Wax-chandlers, & Soap-boilers .	6	11	20	37	2	15	17	34
Tarpaulin-makers ..	2	1	- -	3	- -	6	3	9
Theatres	1	- -	9	10	2	- -	10	12
Tinmen, Braziers, and Smiths	4	15	36	55	- -	19	38	57
Tobacco - manufacturers	- -	5	3	8	- -	2	2	4
Tobacconists	- -	4	6	10	1	16	24	41
Toy-warehouses	- -	2	- -	2	1	1	2	4
Turpentine Distillers	2	- -	- -	2				
Type-founders......	- -	- -	1	1	- -	1	- -	1
Varnish-makers	2	4	2	8	- -	7	3	10
Victuallers	18	87	219	318	10	85	166	261
Vinegar-works	- -	1	2	3				
Vitriol-works	- -	- -	1	1				
Under repair and building	2	15	32	49	9	11	32	52
Unoccupied	4	11	30	45	2	6	22	30
Upholsterers	1	5	10	16	1	2	6	9
Wadding-makers ..	- -	8	2	11	- -	9	6	15
„ „ Gun	- -	- -	- -	- -	- -	- -	1	1
Warehouses........	3	12	30	45	1	1	1	3
Watchglass-makers .	- -	- -	- -	- -	- -	1	- -	1
Waterproof Canvass-makers	- -	1	- -	1				
Waterworks	- -	- -	- -	- -	- -	1	- -	1
Weavers	- -	- -	- -	- -	1	1	- -	2
„ Carpet ..	- -	- -	1	1	- -	- -	1	1
„ Silk	1	3	5	9				
„ Willow ..	- -	1	1	2				
Wharfingers........	- -	- -	1	1	2	1	8	11
Whiting-makers	- -	- -	- -	- -	- -	- -	1	1
Willow-bleachers ..	- -	- -	- -	- -	- -	1	- -	1

	1833 to 1848.				1843 to 1848.			
	Totally destroyed.	Considerably damaged.	Slightly damaged.	Total.	Totally destroyed.	Considerably damaged.	Slightly damaged.	Total.
Wine and Spirit-merchants	- -	12	42	54	- -	5	35	40
Wire-weavers	- -	- -	- -	- -	- -	- -	1	1
Wood-merchants ..	- -	4	2	6	- -	2	3	5
Wool-staplers	- -	1	1	2	1	1	- -	2
Workhouses	- -	6	7	13	- -	2	3	5
Workshops (no hazardous goods in process)	- -	- -	- -	- -	- -	8	4	12
	269	1611	3894	5774	182	1724	3625	5531

Several curious subjects for reflection may be suggested by this Statement, amongst which is the great increase in the yearly average of fires in some particular occupations. For instance "Beershops," "Coffeehouses" and "Chophouses" show a proportion which has increased cent. per cent. in the second period. "Chandlers" have increased 75 per cent, and "Drapers" 40 per cent. In all these cases it is open for enquiry at what rate the numbers of houses occupied by the trade have increased in the same period. The great increase of fires on Railways will be noticed, which have increased from 2 in 10 years to 20 in 7 years. A fire in "Waterworks" may seem an anomaly; but one is placed under that head as having committed serious damage.

Out of the various trades enumerated in the Table, we will select for comparison only those in which, in either one or the other of the two periods, more than one-hundredth part of the total number of fires occurred. In order to form some rough estimate of the ratio of risk incurred by each of these trades, it is necessary to ascertain the number of houses occupied by each trade, and at present no better resource is available than a reference to the Post Office Directory for the year 1846, being the mean of the latter seven years. To the general ratio per cent. of the total number of fires I have added a column showing the proportion per cent of fires out of the total number of houses occupied by the respective trades as ascertained from this source. In "Private houses," and "Sale shops and Offices," which represent very large numbers, this test could not be applied, the former including in the Fires those which occurred in the dwelling portion of houses otherwise occupied as shops, and the latter being too indefinite to be distinguished.

TABLE XI.

Showing the proportion per cent. of fires in the principal trades to the total number of fires which occurred in each of the two periods 1833-42 and 1843-9; together with the proportion per cent., in the latter period, of the average number of fires per annum to the total number of buildings occupied by each trade in 1846.

Occupation.	Proportion per cent. 1833 to 42.	Proportion per cent. 1843 to 9	Houses Occupied in 1846.	Ann. Aver. per cent. of Fires to do.
Bakers	2·49	2·17	2295	·75
Beer-shops	·55	1·16	700	1·31
Booksellers	1·37	1·30	850	1·18
Cabinet-makers	1·46	1·65	613	2·12
Carpenters	4·24	3·78	1320	2·27
Chandlers	·83	1·43	291	3·88
Coffee-shops and Chop-houses	·59	1·12	718	1·25
Drapers	2·01	2·88	850	2·67
Grocers	1·02	1·25	2890	·34
Hat-makers	99	·94	96	7·74
Lodging-houses	7·62	9·53	456	16 51
Lucifer-match-makers	1·09	·74	20	30·00
Oil and Colourmen	1·51	1·61	816	1·56
Private	33·50	29·81		
Sale-shops and Offices (not hazardous goods)	5·63	4·30		
Stables	1·96	1·73		
Tinmen, Braziers, and Smiths	·95	1·03	337	2.42
Victuallers (Licensed)	5·51	4·72	4320	·86
Under Repair and Building	·85	·94		
Unoccupied	·78	·54		
Wine and Spirit Merchants	·94	·72	935	·61
	75·89	73·35		

In the trades above enumerated about three-fourths of the whole number of fires occurred; and it will be observed as a gratifying fact, that not only has there been a slight diminution in the proportion within the last seven years, but that the diminution has been greatest amongst those trades in which the greatest proportion of fires had previously happened. It may perhaps be inferred, that the reduction is not merely a casual circumstance; but the result of greater care, vigilance, or means of averting the calamity of fire. Thus the proportion in "Private-houses" is reduced from 33·50 to 29·81 per cent.; in "Sale shops and Offices" from 5·63 to 4·30; amongst "Licensed Victuallers" from 5·51 to 4·72, and amongst "Carpenters" from 4·24 to 3·78 per cent. The principal increase has been in "Lodging-houses" from 7·62 to 9·53 per cent.; amongst "Drapers" 2·01 to 2·88 and "Cabinet makers" 1·46 to 1·65 per cent.

An examination of the last column will show even by this rude attempt to compare the facts in the different trades, how erroneous it would be to draw conclusions of the ratio, in which different occupations are exposed to the risk of fire, merely from comparing the number of fires themselves. In many cases where the fires are actually the most numerous, they bear the smallest proportion to the number of houses represented as occupied by that particular occupation. Thus the "Lucifer Match makers," amongst whom only occur 74 in 10,000 fires would appear from the small number engaged in the trade, to be liable to fires at the rate of 30 per cent. per annum, or that one fire would occur amongst them in every three years and four months; supposing of course that the names in the Directory comprise the whole number of houses engaged in the trade. On the other hand, "Bakers," amongst whom 2·17 per cent. of the fires occurred, would appear only liable to the risk at the rate of 75 per annum in 10,000 houses occupied by them; and "Grocers" in less than half that number, or 34 in 10,000, the proportion of the total fires amongst them being also one-half the other. Amongst "Chandlers" 3·88 per cent of the buildings occupied by them are damaged by fire in the year; and just double that number amongst the "Hatters," although the risks amongst the former comprise only 1·43 per cent. of the fires, and amongst the latter, about two-thirds only of that proportion. It is sufficient at present to point out the want of information on a topic at once curious and useful; and to indicate how a census, comprising an enumeration of the numbers of the population engaged in different trades, and of the number of buildings occupied by each may be turned to a practical and public use. For want of some such information the writer in the Statistical Journal states, that with regard to Fires—"Among the trades, "Victuallers" have an unenviable pre-eminence, the number of fires in this class of houses amounts to 156" (out of 2476 from 1833 to 1837.) Whereas it will appear in our table, by comparing them with the number engaged in the business, that though the proportion of fires to the total number is 5·51 per cent. in the ten years within which his comparisons are comprised, yet the proportion to the houses so occupied was on the average of the last seven years little more than 86 in 10,000; that they stand only fourth from the lowest in the list that I have given; and do not amount to the twentieth part of fires which occurred in "Lodging houses," and just one-ninth of what happened amongst "Hat-makers."

Although the information is so deficient at present, as to render any conclusions with regard to the risks of insurance too unsafe to be admitted, it may not be uninteresting to show in what manner the facts might be used; assuming, for the present, that the record is sufficiently near to the truth to permit of its practical application to varying the premiums according to the risks of different trades. We will take only two or three of those occupations, in which the largest numbers are found in the Directory, and which from their nature are more plainly defined than others. Amongst Bakers for instance, numbering 2295, and amongst whom the average of fires appears to be 2·17 for every hundred fires that occur. Let us again assume that every house is insured to its full value, and for the sake of simplicity, that that value is on an average £100 only to each house. We understand well enough what a "total loss" means. It may be more difficult to define what is meant by "seriously damaged," and "slightly damaged." The records of insurance offices will probably show damages paid for a burnt cap,—a jacket which a lucifer match in the pocket has seriously injured,—a carpet which the spilling of live coals has irretrievably ruined,—a sheet which the cat has dragged against the fire, a picture or a book spoilt by smoke, or a bed curtain which a drunken lodger has set fire to at the imminent risk of his own and others lives. Many of the fires to which the indefatigable Mr. Braidwood and his gallant Fire Brigade have been called, have arisen from equally trivial causes, as our readers will see hereafter; but we are now considering only those which it has been thought necessary to report, and it will suffice for the present purpose to assume that "seriously damaged" means where one-fourth of the property has been destroyed, and "slightly damaged" where one-tenth only has been consumed. The damage books of Insurance Offices could probably show, on the average of a multitude of cases, the exact proportion (which may differ in different trades,) of the property destroyed to its full value, or at least to the value insured. The above admission, however, will equally well answer our present purpose to show the use of the facts when brought together. Turning to Table XI then, it will be seen that amongst Bakers in every hundred fires there will be 3⅓ × £100, 25 × £25, and 71⅔ × £10. Total about £1674·7 of property destroyed; and as the proportions of fires to the trade are given as 75 in 10,000, every 10,000 houses would be liable annually to loss by fire of £1256; or the premium from these rough data would be rather more than 2s.6d. per cent. This includes the Ship-biscuit and Muffin Bakers, the proportion of "total loss" in the first of these having been 1 in 4 in the seven years. The Grocers, 2890 in number, in the same way represent "Total Losses" 7·25; "Seriously damaged" 60·87, and "Slightly damaged" 31·88. Total, taking £100 for each insurance with the proportion as before, £2565·5; but the fires being only ·34 per cent, the premium from each house will appear as ·087, or 1s.9d. for each £100 insured. Again Licensed Victuallers we have enumerated as 4320 in number. They form an important class. The fires amongst them are represented as 86 in 10,000 annually. The proportions of "total losses" are 3·83; of "seriously damaged" 32·57; of "slightly damaged" 63·60 per cent. Therefore supposing each insured for £100 (3·83 × £100) (32·57 × £25) and (63·6 × £10.) Total £1833 for the actual losses in 100 fires, which for every 100 houses would give an annual loss of £15·76, or a premium of 3s. 2d. would be necessary from each.

It is generally estimated that there are in the Metropolis at the present time about 300,000 houses, and we have seen that the number of fires are more than 800, or about 2⅔ to every 1000 houses. Taking the proportion of "total losses" as 4, "seriously damaged" 29½, and "slightly damaged" 66½, as we found them to be, from 1833 to 1849, we should have (4 × £100) (29½ × £25) and (66½ × £10) average payment = £1802·5 in every 100 fires; and which being multiplied by 2⅔ would for each 1000 houses insured for £100 each, show a loss of £4806 or nearly 1s. per cent. Supposing that on an average only half the property was insured, it is evident that the premiums would only be half sufficient to meet the claims, and consequently they must be doubled. If 25 per cent. were uninsured, the premiums paid would only be equal to £75 in every £100; and therefore the premiums to be actually paid must be increased by one-third. These rough calculations are independent of all expenses, interest on capital, &c. Many other points would be necessary for consideration in preparing a collection of data for such a purpose. Thus, no doubt, the locality, the construction of the buildings, the distance from a Fire Engine Station, and still more the manner in which an adjoining building may be injured by a fire breaking out in a neighbour's house, would have to be considered. A fire so arising may be the cause of serious damage, which could not be attributed to the trade carried on there; but to the dangerous proximity of other trades. Still all these cases would form averages in the long run; even the amount of damage inflicted by a fire in one trade on the houses adjoining, and a collection of such facts would bring together subjects of curious and eventually useful enquiry.

Causes of Fires.—We now proceed to a Table showing the general summary of the causes, by which fires have been occasioned, divided into the same periods as the last table. A careful enquiry is instituted by the Firemen into the origin of every fire, and endeavours are made as far as possible to ascertain the causes which led to it. The difficulty of arriving at any certain result is no doubt very great. Some cannot be traced, because it is the interest of parties to conceal the fact; and Mr. Baddeley, in the course of his excellent Reports, gives many striking instances of suspicion which have been justly excited, but in which the suspected parties have escaped in spite of almost proof of guilt. The reluctance of the offices to interfere in the matter, or their unwillingness to lose reputation by refusing to pay a claim, is but natural, even though, if the case were contested, it might often lead to the detection and punishment of a criminal. In other instances, the natural confusion of mind in moments of such danger, the difficulty of tracing the cause when the bursting forth of flames and smoke, may have concealed the circumstance, or the spot in which the fire commenced; the large proportion of fires which occur in the night-time, the length of time which a fire may smoulder before it breaks out, leading the party questioned to look for incidents more recent than the actual origin, and various other explanations may be offered as to the diversity of causes alleged. It will appear, however, that every year more minute information is obtained, and it is remarkable within what narrow limits the principal causes keep to the average in a long series of years. .Every year, too, the proportion remaining undiscovered is diminished. From 1833 to 1837 about 20 per cent. were unknown; but, on the average of 1833 to 1842, less than 12 per cent. remained undiscovered, and from 1843 to 1849 little more than 7 per cent. The minuteness of enquiry will not only tend to give greater facilities of drawing useful conclusions, by enabling the enquirer to classify facts; but will lead, as it has already done, to direct attention to those causes which are of most frequent occurrence, and capable of remedy by watchfulness or change in habits. It serves also, to indicate how men of science can give their services most effectually in the preservation of life and property. Thus the greatly increasing cause of fires, "spontaneous ignition," has led to some interesting chemical experiments into the nature of substances that may be thus dangerous to society without human agency. It is remarkable that one of the earliest instances, which led an eminent chemist to investigate this subject, was the wretched fate of a young man in 1829, who was hanged as an incendiary, when it afterwards appeared clear to him and several other scientific men, from careful enquiries, that the fire was caused by "spontaneous combustion" only. The danger of the use of naphtha lamps would also not have been so visible, if the accidents from this cause had not been distinguished as we see them in the following Table.

TABLE XII.

Showing the causes of Fires in the two periods 1833 to 1842, and 1843 to 1849, with the proportion per cent. from each cause to the total number of fires in each period.

CAUSES.	1833 to 42 Total No.	Proportion per cent. of Fires.	1843 to 49 Total No.	Proportion per cent. of Fires.
Accidents of various kind, for the most part unforeseen and unavoidable	293	5·07	90	1·63
Apparel ignited on the person	48	·83	27	·49
Bleaching, (basket, brushes, nuts, ginger, and straw)	3	·05	12	·22
Candles	514	8·90	623	11·26
Carelessness, palpable instances of ...	171	2·96	120	2·17
Cat (upsetting chair, lucifers, clothes horse)	6	·10	15	·27
Chemical experiments...............	..	..	2	·04
Children (playing with candles, fire, gunpowder, lucifer matches)	101	1·75	137	2.48
Chimneys taking fire and igniting the building	12	·21		
Cinders (and soot, put away hot)......	4	·07	55	·99
Coffee (chicory, &c.) roasting	5	·09	7	·13
Coke (burning of) and cork do.........	..	..	5	·09
Coppers (set against partitions or on floors)	4	·07	12	·22
Curtains, bed and window............	882	15·29	857	15·49
Drunkenness	38	·66	46	·83
Fire (sparks from), and from locomotive engines	89	1·54	268	4·84
Fires (kindled on hearth, and other improper places)	73	1·26	63	1·14
Fireworks (making, selling, or letting off)	28	·49	42	·76
Fire-heat (applications of, to manufacturing purposes)	269	4·66		
Flues (defective or over-heated, foul, blocked up, &c.)	696	12·05	555	10·03
Friction of machinery	10	·17	7	·13
Fumigation (and bug-hunting)........	30	·52	19	·34
Furnaces...........................	119	2·06	132	2·39
Gas (escape of, defective or repairing, fittings, accidents in lighting, &c.) ..	413	7·15	364	6·58
Gunpowder	16	·28	6	·11
Hearths (defective)	3	·05	15	·27
Hot-water and air pipes	..	..	3	·05
Illumination	3	·05		
Kilns over-heated....................	3	·05	12	·22
Lamps (oil, naphtha, and sparks from) .	28	·49	48	·87
Lightning	6	·10	5	·09
Lime (slaking or heating)	27	·47	34	·62

CAUSES.	1833 to 42 Total No.	Proportion per cent. of Fires.	1843 to 49. Total No.	Proportion per cent. of Fires.
Linen (drying or airing before the fire)	252	4·36	255	4·60
Lucifer matches (making, using, accidentally ignited, by rats, &c.) ……	85	1·47	104	1·88
Naphtha (rectifying, experimenting with) …………………………	..	..	6	·11
Ovens (over-heated, defective, &c.)….	69	1·20	48	·87
Reading (and sewing) in bed ……..	13	·23	8	·14
Shavings (loose, ignited, &c.) ……..	145	2·51	187	3·38
Smoking meat, &c. ………………	..	..	4	·07
Spontaneous ignition (coals, cotton, India rubber matting, guano, greasy rags, hay and straw, lamp black, lucifer matches, oil and sawdust, &c.)	91	1·58	132	2·39
Steam boilers, (heat and explosion of, and locomotives) ………………	2	·03	9	·16
Stills (illicit)……………………	4	·07	7	·13
Stoves (defective and over-heated, gas, drying, pipes, hot air, &c.)………	299	5·18	311	5·62
Sugar boiling……………………	..	..	1	·02
Suspicious ……………………	48	·83	77	1.39
Tobacco (smoking, &c.) …………..	77	1·33	163	2·95
Turpentine (melting, also camphor, sulphur, sealing wax, &c.) …………	21	·36	121	2·19
Wilful. ………………………	85	1·48	126	2·28
Unknown …………………………	689	11·93	391	7·07
	5774	100·	5531	100·

On examining this Table it will be noticed that an increase appears to have taken place under some of the causes in the latter; but allowance must be made for the proportion "unknown" having diminished nearly 5 per cent. in the second period. The numbers formerly under this head will consequently be classed under some other known cause. Of the causes in which the greatest diminution is found may be mentioned, "unavoidable accidents," from 5·07 to 1·63 per cent.; "carelessness" from 2·96 to 2·17 per cent.; "Flues," from 12·05 to 10·03 per cent.; "Gas," from 7·15 to 6·58 per cent., and "Ovens," from 1·20 to ·87 per cent. On the other hand, after making allowance for the unknown becoming known, there appears an increase in accidents attributed to "Candles," from 8·90 to 11·26 per cent.; to "Children playing with fire, &c." from 1·75 to 2·48 per cent.; "Fire, sparks from, &c." from 1·54 to 4·84 per cent.; "Lamps," (which is principally owing to the use of naphtha,) from ·49 to ·87 per cent.; and "Tobacco smoking, &c." from 1·33 to 2·95. This table may serve to point attention to those causes, in which excess prevails, and suggests to every householder the importance of care in those matters which, however trivial they may appear, may end in an event of so deplorable a character. It is painful to observe that "wilful fires" have increased from 1·48 to 2·28 per cent. To this, the attention of the police, rather than of the householder, should be directed.

A similar enquiry might be made into the principal causes of fire, under the different trades and occupations (of which we have given the list in Table XI.), with the view of ascertaining what proportion appears to depend on the nature of the trade, and what is more general and capable of being diminished by the exercise of vigilance or precaution. A general summary was given from Mr. Braidwood's Report, in the "Statistical Journal," vol. 7, for 1844, for the ten years 1833 to 1842; and I have collected the facts, but with a more minute subdivision of causes, for the seven years 1843 to 1849. Space, however, will not permit the comparison to be made in this number of the *Assurance Magazine*. If the subject should appear to be of sufficient interest, it may be completed in a future paper; and in the meantime it will be sufficient to exhibit the proportion occurring by various causes, in what are described to have happened in private dwellings. The total number of fires in private houses from 1843 to 1849, was 1649. It should be remarked that this term comprises any private portion of a dwelling in which a fire originated; even though the rest of the house might be occupied for purposes of trade, the object being to distinguish between fires which are caused by the accidents of trade, and those not so arising. Every cause has been stated, and the list will be found to comprise nearly every one included in the general catalogue. The principal exceptions are "spontaneous ignition" and "accidents from machinery."

TABLE XIII.

Showing the causes of Fires in Private Dwellings and the proportion in this class per cent. of the Total Fires.

CAUSES.	No. of Fires.	Total.	Proportion per cent.
Candle		222	13·46
Carelessness		10	·61
Cat	6		
" upsetting lucifers	1		
" " candle	1		
" " clothes horse	1		
Dog " "	1		
		10	·61
Children	20		
" left	1		
" playing with lucifers	13		
" " with fire	25		
" " with fireworks	1		
" " with candle	1		
		61	3·70
Copper fire	2		
" flues	23		
" furnace	1		
" badly set	3		
" set in floor	1		
" overheat of	1		
		31	1·88
Curtain		526	31·91
Chair falling into fire		1	·06
Flues	152		
" blocked up	10		
" foul	14		
" adjoining	20		

CAUSES.	No. of Fires.	Total.	Proportion per cent.
,, of hot plate	6		
,, ,, in adjoining house	1		
,, hot air	1		
,, kitchen	6		
,, oven	1		
,, laid on timber	1		
,, soot in	1		
,, defect in	4		
,, timber in kitchen	1		
		218	13·22
Hearth, timber under	3		
,, fire on	7		
,, defect in	3		
		13	·79
Firemen not being called		1	·06
Fire grate, heat from	2		
,, place set on floor	3		
,, grate, defect in	1		
Furnace, hot water	1		
,, of boiler	1		
Kitchen range	3		
,, grate	1		
,, cooking apparatus adjoining	1		
		13	·79
Gas	10		
,, explosion of	2		
,, from the street	3		
,, escape of	1		
		16	·97
Hot ashes	1		
,, ,, in dust bin	1		
,, cinders	5		
,, charcoal	1		
		8	·48
Incendiarism		9	·55
Intoxication		19	1·15
Insanity		1	·06
Lamp	1		
,, night	1		
,, Naphtha	3		
,, ,, upset	1		
		6	·36
Light dropped down the area		1	·06
*Lucifers		18	1·09
Lightning		3	·18
Oven		1	·06
Old age		1	·06
Poker falling out of fire		1	·06
Repairs		1	·06
Salvage drying		1	·06
Sparks	9		
,, from fire	53		
,, from lamp	1		
		63	3·82
Stove	8		
,, in library	1		
,, in adjoining house	4		
,, heat of	7		
,, hot air	1		

CAUSES.	No. of Fires.	Total.	Proportion per cent.
„ hot plate	1		
„ badly set	3		
„ pipe	4		
„ overheat of pipe	2		
		31	1·88
Soot taking fire	1		
„ put away on fire	2		
		3	·18
Turpentine, bottle of, falling near a candle		1	·06
Accidents from domestic employments, &c.			
Airing bed	2		
Bed, reading in	5		
„ smoking in	1		
„ sewing in	2		
Bleaching walnuts	1		
Boiling tar	3		
„ pitchpot boiling over	1		
„ drawing off tar	1		
„ heating ether	1		
„ varnish boiling over	1		
„ melting grease	1		
„ „ bees' wax with turps	1		
„ making varnish	2		
Bug hunting	2		
Burning charcoal	1		
„ wood placed in coal cellar	1		
„ old paper	1		
Experiment	1		
Fireworks	1		
Gunpowder, playing with	1		
Fumigation	11		
Firewood laid on the stove to dry	1		
Fire raking out on hearth	1		
Iron hanger put away hot	1		
Lamp left burning in cupboard	1		
Mattrass placed before the fire to dry	1		
Private still	1		
Pasting charts	1		
Tarring a water-butt	2		
Tobacco smoking	18		
		68	4·12
Doubtful		16	·97
Unknown		275	12·68
		1649	100·

It will not fail to strike the reader, in comparing this class with the general causes, that whereas, in the latter, accidents attributed to "candles" were 8·90 per cent., they here form 13·46 per cent. of the whole; that whilst "curtains" claimed 15·29 per cent., they here figure as nearly 32 per cent. "Flues" do not differ much, being 12·05 in the latter, and 13·22 per cent. in the above Table. Accidents from "gas," as might be expected, are very few in private houses, only ·97 per cent.; whilst in all trades combined, they form 7·15 per cent. We should, perhaps, scarcely expect to find the domestic "cats" so effectively mischievous. The fires caused by their agency are ·61 per cent. The large proportion of 1·15 per cent. is attributed to "intoxication," and though ·61 per cent. arises from pure "carelessness," many of the other causes, which we have placed together under the head of "domestic employments," partake very strongly of the same character, as will appear on inspection of the Table. Out of 68 fires of this class, 18 arose from "tobacco smoking." Lastly, it may be remarked, that the large number of 16·68 per cent. in private dwellings are described as due to causes unknown;" although during the same period, if these be deducted from the general total "unknown," it will leave only 2·10 per cent. in which the causes of fires in various trades were undiscovered.

Causes of Fires in which the Premises were totally destroyed.—I had prepared a small Table, in which the different fires under this head were classified in the two periods of ten and seven years, under the respective causes which appeared to have led to the total destruction of the premises. These are generally given as "the distance from London, or the nearest station for engines," which sometimes extends even to 10 or 12 miles; the tardy or insufficient supply of water," in one case in which two large floor-cloth manufactories and two private houses were burnt down—one plug was not open for half-an-hour, and another for an hour and a half; "the combustible nature of the buildings or materials contained in them," such as cabinetmakers, carpenters' workshops in timber sheds, oil warehouses, &c.; "the small size of the buildings," in one case seven small unfinished cottages, used as a work shop, connected together by stacks of timber in front, and in another case nine houses (seven being small private houses) were burnt by lightning,—the "excessive age of the premises," from which the houses fell in before any decided attempt could be made to save them; and lastly, "the extent to which the fire had arisen before the arrival of the engines." Under these different heads, altogether 450 events were classified; but it was so difficult to separate one cause from another, (the want of water for instance, or the distance from the nearest station, and the small size or the combustible nature of the building being frequently all combined as elements of destruction,) that I found it useless to print the proportions at present, though an attempt has already been made to compare these causes in the "Statistical Journal." It may be remarked, however, that from 1833 to 1837, in 145 fires described as "total losses," 182 buildings were destroyed, and from 1843 to 1847, in 181 fires 229 buildings were destroyed, both being very nearly in the same proportion; namely, 126 buildings to 100 fires. In the last year, 1849, there was no more than one building "totally destroyed" in any one fire, a gratifying fact, which had not occurred before since the establishment of the Fire Brigade.

The space allowed us has been so occupied with the collection and arrangement of the large mass of facts with which we have been favoured, and in bringing together the results to the latest period, and in such a form that from the comparison of the same in two different periods we might, if possible, draw some useful conclusions from them, that we could not now touch upon many topics which are, nevertheless, of the highest interest and importance. The large number of fires which are suspected, and, by the indefatigable exertions of Mr. Payne, the coroner, in recent cases, frequently proved to be "wilfully occasioned," are beginning to assume a most serious aspect. It is very much to be feared, that the liberality of the Insurance Companies, forced on, perhaps, by the efforts to maintain a high reputation against a competition equally dangerous to the public and themselves, leads to the prompt settlement of losses in some cases in which, if a public prosecutor existed, a criminal would be punished instead of a sufferer rewarded. Many instances might be cited from the reports in the newspapers of the day, or from those collected by Mr. Baddeley, not merely of doubtful cases, but even of some in which the verdict of a coroner's jury has declared, that "the house was wilfully set on fire by, &c." Yet the parties have escaped. In another frightful case five lives were lost. The landlord had insured house and furniture *one week* before the fire, for double the value set upon them by the Assessor of the Fire Office. He accepted the diminished value rather than proceed to trial. In another case, a party had insured for £800, and he claimed "£680 for a fire which took place in a shop 15 feet long by 9 feet wide, and which did not burn for a quarter of an hour." The claim was disputed on the ground that the fire had been wilfully caused, and that the claim was fraudulent. The case wore so bad a complexion that the plaintiff's counsel withdrew, and he was non-suited. It would be a curious subject of enquiry, and one on which only the records of Insurance Offices could throw light, what is the average length of time that an insurance endures before a fire takes place, and in cases where it occurs very much below the average time, whether the general tendency to make an insurance below the value of the property is not reversed. Another point worthy of observation would be, whether, out of a given number of individuals assured in a particular trade, more than the average proportion of claims is paid in the course of a few years to the same individuals. We read of one case in which it was stated that "this was the third fire which had happened on the premises of the insured."

The subjects of spontaneous ignition, (and it is stated as a remarkable fact in 1846, that nearly every fire which has happened on railway property, has originated in spontaneous combustion),—of inadequate supply of water, of which the most lamentable accounts are given—of the carelessness of individuals in throwing down lighted cigars, or lucifer matches—of the danger of naphtha and other spirit lamps,—and many singular topics might be illustrated and enlarged upon from the examination of the facts recorded in this article. I must, however, leave them for the consideration of my readers, and close this hasty inquiry by a short notice of the

Fire Brigade—whose extraordinary efficiency, under the training and superintendence of Mr. Braidwood, have frequently saved from loss an enormous amount of property, which seemed destined to be the inevitable prey of the flames. The skill and intrepidity of the chief, and the exertions of the men, have preserved this great city from calamities which, in such a mass of buildings, occupied by many hazardous trades, in some cases full of combustible materials, and in some parts of the City exposed from age and nature of construction to the most fearful conflagration, if a fire once begins, it is most surprising that we should so long continue to escape. It is still more creditable that such a body of men so organized, so devoted to the public service, so zealous, and intelligent, should be paid and supported, not as in other countries, by the Government for the good of the State, which it undoubtedly is, but by the combined efforts, the wealth and the public spirit of private companies. These could not have been blamed if they had left the public to the tender mercies of Government protection. Their peculiar business was not to diminish, but to indemnify against loss; and if the risks were greater, the public must have paid an adequate premium. But, happily, they have taken a a nobler view of their responsibilities, and the establishment of their valuable brigade has tended as much to the service of humanity as to the interests of the companies themselves. It is at the same time a standing reproof to the Government of this country that the protection which we owe from the ravages of fire is due to the mere casualties of private enterprise, and that if any cause tended to the disunion of the companies, or if the effects of competition led those which are old established to think the force too costly to maintain for the benefit of the new, a City, with two millions of inhabitants, would be left to the notorious inefficiency of parish engines, or the desultory efforts of individuals impeding each other.

Preservation of Life from Fire.—Even the necessary training for the preservation of Life from Fire is not regarded as a part of the duty of the Police, if we may judge from the complaints which are frequently made of their incapable, though zealous and anxious efforts to render assistance. The Royal Society for the Preservation of Life from Fire is one of those noble Institutions with which this Kingdom abounds, and of which we may justly be proud. The Report states that their object is "to provide Stations, and maintain *Fire Escapes* throughout London, at distances of half a mile from each other." "Every Station costs the Society, for the first expenses of building Fire Escape,. Watch-box, Tarpaulin, &c., about £70, and the annual cost of maintaining each, with a conductor, is about £80, and your Committee take this public opportunity of stating, that, having an earnest and great desire to extend this great public good all over London, they will endeavour to establish a Fire Escape in any District half a mile distant from the next Station, where Parochial Officers will so far co-operate with them as to vote a donation of £50 towards the first expenses, and £10 10s. a year towards the annual expenses; and trust to the good-feeling, the liberality, and the self-interest of the inhabitants of each district to contribute sufficient funds to continue the same in a state of efficiency." Appealing in such a cause, and with such practical good sense in their plans, with previous success to point to, and such fearful calamities to avert, how can they appeal in vain? In the dreadful circumstances in which their servants hasten with relief, rich and poor are equally helpless; and if some of the harrowing details could be given of the circumstances in which lives were lost, and some of those in which the Fire Escapes of this Society have been effectual in saving life, every reader must acknowledge the value of such a Society, and willingly aid their admirable efforts. I will quote only two cases, one of which occurred at Mr. D. Bowman's, in Tottenham Court Road, in March, last year. "The fire was discovered raging furiously in the shop; and an alarm being given, Conductor Chapman, with the Royal Society's Fire Escape from Hart-street, was promptly on the spot. On his arrival, the staircase was in flames, and he was told that several persons were in the house, although they did not appear. Chapman placed his escape against the second floor window, ascended and entered, although a volume of dense black smoke was pouring from the window, which nearly overpowered him, and instantly extinguished his lamp. Three others were successively handed up to him, and one remaining alight, he commenced a search. Calling aloud, he was answered by a kind of stifled cry from a back room, which he entered, and encountered a man, who groaned out, "Oh! save my wife!" Groping about, the conductor laid hold of a female quite exhausted, but clasping two children in her arms. Having brought them all into the front room, he placed them safely in the canvas trough of the escape, and they reached the street without injury. The conductor followed them down in a dreadful state of exhaustion, having achieved the most heroic rescue of life from fire ever recorded."

Again, in April of this year, at a fire in Foster-lane, Fire Escape Conductor Myers, attended with his fire escape within three minutes of the alarm. "There was great excitement and confusion, it being generally reported that from six to eight persons were in the house, unable to escape, and, from the rush of fire, the destruction of all appeared inevitable. Without a moment's loss of time, the conductor ascended to the second floor, and broke open with his hatchet the window pointed out to him. It was as much as he could do to stand against the volume of smoke which poured out, but he finally succeeded in discovering three persons in the room, quite unable to assist themselves. With the utmost difficulty, and after the most praiseworthy exertions, he eventually brought them down the Escape, not, however, before two of them had been much burnt. The persons saved were Frederick Sutton, the landlord; his son, William H. Sutton; and daughter, Mary Ann Sutton."

Could the Roman bay-leaves be more worthily bestowed than on such men?

Few persons are aware of the number of lives which are sacrificed yearly in fires for want of early or efficient assistance. I give the following summary from Mr. Baddeley's Report, for the last 17 years, arranged in the same periods as my first Table, so that they may be compared with the total number of fires.

Years.	Fatal Fires.	Lives lost.
1833-7	47	66
1838-42	77	126
1843-47	74	105
1848-9	33	45
	231	342

The following Table will show the increasing usefulness of the Society, and that a total of 113 persons have, in less than seven years, been preserved from the most horrible death by the self-devoted exertions of their servants, often at the imminent peril of their own lives.

Summary of Fires attended, and Human Life saved, by means of the Society's Fire Escapes and Conductors, since its re-establishment in 1843.

Year.	Number of Stations.	Fires attended.	Lives saved.
To March 31st, 1845 . .	8 increased to 11	116	13
" 1846 . .	11 " 15	96	7
" 1847 . .	15 " 21	139	11
" 1848 . .	21 " 25	197	17
" 1849 . .	25 " 26	223	31
" 1850 . .	26 " 28	198	10
To September, 1850 . .	28	105	24
		1074	113

The Society appears to be conducted at the most moderate expense; but the Directors, in their Report, are compelled to acknowledge, that with the exception "of the continued support of Her Most Gracious Majesty the Queen, and the handsome donation of £100 from the Corporation of the City of London, and donations from several of the City and Metropolitan parishes,"—the Society is indebted for the present satisfactory state of its finances more to the kindness of its friends and immediate promoters, and less to general liberality than the public character of the benefits conferred entitle it to claim." It deserves encouragement, for it is our only organized means of preservation for Life against Fire, as the Fire Brigade is for property—our substitute for State protection,—perhaps far more efficient in proportion to its means,—certainly far less costly,—and honourable alike for the humanity of its objects, and for the noble devotedness, the daring courage, which its agents have displayed.

39, King Street, Cheapside,
December, 1850.

On the Doctrine of Constructive Total Loss. By Manley Hopkins, Esq., Average-Adjuster.

It would be very difficult to select a more simple idea, couched in more simple terms, than that conveyed by the expression 'Total Loss.' It would not be easy to find an idea which has wandered farther from its radical, and has *by development* undergone greater transformations than that of 'Total Loss,' according to the doctrine as now expounded.

Total Loss is the privation of a thing that was in possession. It is, as regards its subject, the annihilation of a relative object.

Rights must have their definition in language, and language is liable to change. The primitive meaning of words is soon altered or enlarged. It is a vain attempt in any language to hold one word to one thing for a continuance. In the arts this is attempted to a certain extent, and the result is, that each art comes to have a technical vocabulary, understood only by those who engage in that art, or by those who study that vocabulary,—useless, or nearly so, to the rest of the world.

More usually secondary meanings take the place of, or are made co-ordinate with, their originals. Words, like the first road in a country, are formed straight and separate; they answer their purpose for a while:—then necessity cuts other roads parallel with or diverging from these, till at last great ways, lanes, and paths make a network over the face of the land—convenient but intricate, useful but apt to mislead,—easy to err in.

It seems needful to recal such truisms, when we are about to consider so startling a conversion of terms as is contained in the present subject; where we speak of that as lost which remain in place and *in specie*, and call that a *total* loss when the greater portion of the object remains in possession.

The difficulty about terms was sought to be removed by the introduction of a reconciling adjective. *Constructive* was added to the name of *Total Loss*, and the whole represents a theory which, though somewhat at variance with common sense, now obtains generally, and affects the practice of Settlements on Policies. Yet should the explanation of a Constructive Total Loss be made for the first time to an ordinary thinker, he might probably be struck with an antithesis, and conclude that, as extremes meet, a *Con*structive Loss is the antipodes of a *Des*tructive one.

The total Loss of an object insured, and here the primitive meaning of the words is intended, forms the most simple and legitimate claim on a Policy. Whether a vessel founders on the high seas, and sinks, or strikes on rocks, and is beaten piecemeal by the waves, or is consumed by fire, or, in fact, perishes from any of those causes against which underwriters guarantee an indemnity to the assured, the result is the same, and a loss in full must be paid by the Insurers. But ere long, cases would arise in which an insured owner would seek to be relieved from the strict letter of his contract, and an extension of its meaning would be sought. An instance would soon be found where the absoluteness of the loss of the ship could not be proved.

A vessel is missing:—the time for its arrival is overpast;—doubts of its safety increase to suspicion that some accident has befallen it; and as time elapses, the probability of its loss grows into an almost certainty. Here, whilst there is only negative evidence of loss, it is reasonable that such proof should be accepted; and the custom became established, that according to different distinctions of Ships, corresponding periods of time in which no intelligence was obtained concerning them were made tantamount to absolute proof of their destruction.

And again; a Vessel may be pirated by her Commander and crew: the crime affects the Insurers under the head of Barratry. Here, in fact, no more destruction may have happened to the Ship than that she has been carried to a port not intended by her owner, or has been diverted from a certain path across the ocean to traverse other paths; nevertheless, in reference to the Insurers, this is a Total Loss, because, although the presumption may be strong that the Ship still exists *in statu quo*, yet she is irrecoverable, and therefore lost. And notwithstanding that the Insurers have no part in appointing the Master, a person in whom their interests are so materially concerned, yet all the consequences of the bad conduct of that person are assumed by them, and such barratrous abstraction of ship or of goods was also included in the category of Total Loss.

Thus actual proof, and absolute destruction, were waived in some cases when a total Loss was claimed:—in other words, Insurers paid for the total Loss of an object which probably existed unimpaired, or of which no proof of destruction could be produced.

Still, although the wall by which an Insurer's liability was limited, was thus somewhat broken down, such cases as the two just cited did not affect the reasonableness of the system. There was an absence of the property insured, and this absence or deficiency came near to the original idea of a Loss. But soon other extensions of meaning began to creep through the breach. "When we speak of a Total Loss," says Justice Park in his learned work on Insurance, "We do not always mean to signify that the property insured is irrecoverably lost or gone: but that by some of the perils mentioned in the Policy, it is in such a condition as to be of little use or value to the insured, and so much injured as to justify him in abandoning it to the Insurer, and in calling upon him to pay the whole amount of his Insurance, as if a total Loss had actually happened." And our Courts of Law give us frequent proofs by their judgments that combinations of circumstances may arise, their first causes being in perils for which the Insurers hold themselves liable, amounting to something as disadvantageous to the assured as if his ship were entirely lost. Such circumstances are to be construed into total Loss: and thus, capture by enemies, excessive damage by storms, or by stranding, have been fruitful grounds for *Constructive Total Losses.* It has been decided too, that the *species* of a thing remaining is not an answer to a claim for total Loss if all use of that thing be lost through the perils to which it has been exposed.

This is not an unreasonable doctrine: it is but another instance of 'development,'—the expanding of a primary idea. It is sanctioned by law, it is admitted in practice; nevertheless its tendencies may be dangerous, and the unfolding germ requires limits to its growth. We have to provide ourselves, therefore, with measures to ascertain at what point an accumulation of deteriorating circumstances is to be held equivalent to an entire loss, and what degree of change of condition amounts to a loss of use.

The expenses of restoring what has been destroyed, and of repairing what has been injured about a ship, are the most common form of a Ship's Constructive death. The difficulties of carrying on repairs, or of procuring materials for those repairs, the inability of raising means to pay the necessary disbursements arising in a foreign port, or the exorbitant rate of interest demanded for money required for such disbursements, are the usual proximate causes which lead to an abandonment of the Ship to her Insurers. The rules which Courts of Law in this country have laid down to determine in such cases the question of *Total Loss*, or *not Total Loss*, appear to be these:—that if the expenses of repairing a damaged ship should exceed the value of that ship after being repaired, she may rightly be abandoned to the Insurers as totally lost. Again: what would be the course of a reasonable man uninsured under similar circumstances, as whether he would proceed to repair his vessel, and continue the voyage, knowing the expenses that must be incurred, and the difficulties which must be overcome in doing so, or whether he would voluntarily abandon his adventure by selling the ship—whatever course the jury finds would be pursued by him, is to be conclusive as to the Insurers' liability for a total Loss.

But while definite rules of law are thus fixed, the difficulty of applying them remains. Each case must rest on its own merits: the entire circumstances are alike in scarcely any two instances; the evidence is *ex parte*, and often incomplete, and it is frequently as difficult to ascertain the correctness of the test, as it is to decide on the result when the test is applied.

But the difficulties do not end here. It has hitherto been taken for granted that the primary causes leading to the Constructive Total Loss are those acknowledged by the Insurer as affecting him. In many cases, however, it is a combination of causes which leads to the result; and of these mixed causes some are of a nature that do not affect the Insurer's responsibility, and, consequently, in which he ought not to be concerned about the event. For a ship may die a natural death; she may be so weak from sheer old age as to be no longer able to contend with ordinary winds and seas; she may sink from rat-holes, or perish through natural defects. These causes, resulting in total Loss, are not among the perils taken upon himself by the underwriter; and they ought no more to affect his Insurance than if he had not underwritten the Policy. Still he is at a disadvantage: and should a ship sink at sea, and the Insurer resist paying a total Loss on the grounds of unseaworthiness, or natural defect, the *onus* of proof lies on him to show the ground of resistance, a thing generally difficult or impossible to do, inasmuch as the Ship's 'Memorial has perished with' her. Should it happen that from such causes a vessel is forced into a port of refuge, and she is there abandoned, and Constructively Totally Lost, the Insurer might escape by producing evidence of the cause of her loss: but let it happen that two or many causes conspire to eventuate the Constructive Loss of a Ship, some of them being perils undertaken by Insurers, and others, for which they are not liable, here the logical inference would be that the Insurer's Loss is limited to the amount that can be shown to proceed from circumstances of which he takes the risk; but practically it occurs that the *whole result* of such mixed causes is cast upon him, the Owner abandoning the Ship to him, and claiming a total Loss.

The case of the 'Broxbornebury' tried in the Court of Common Pleas is very much in point; and I cannot help considering that the verdict given therein afforded a dangerous precedent in establishing the principle; that where several causes concur in producing the abandonment of a ship, and her consequent sale, Insurers are liable to the full amount of their Policy with benefit of salvage, although one or more of the causes which led to the condemnation were of a nature that the underwriters never undertook to insure against.

The 'Broxbornebury' was built in the year 1812. In 1839 she was purchased at auction by a ship-builder, and was put into a state of efficient repair, under the direction and supervision of Surveyors to Lloyd's Register Book. In 1841 she returned to England from a foreign voyage, when she was again surveyed, repaired, and was continued on her class of 'red dipthong.' On her subsequent voyage she experienced a violent hurricane, and was carried into Mauritius; she was there surveyed, when her sternpost was found to be badly started, the bowsprit beam sprung, the upper works seriously damaged, and the vessel leaking badly. The surveyors also found evident signs of decay in the ends of the timbers, so that on putting their hands into the air-holes, they brought out handfuls of rotten wood. One surveyor expressed himself that the Ship was "as rotten as a pear." They ordered the copper to be stripped off, and the Ship repaired. Before proceeding with these repairs, however, estimates were procured from shipwrights of the cost of effecting them. They amounted to 40,000 dollars and upwards, equal to about £8,000. To this would have to be added Bottomry Premium, and some other charges. Upon the ground of the great expenses necessary for repairing the vessel, she was condemned, and was broken up. The Owners claimed for a Total Loss on their Policy, which was resisted, and the Insurers paid into Court 50 per cent. on the vessel's value, in full of all claims on themselves for repairs and expenses. They brought evidence to prove that all the damages set forth in the documents, for which they were responsible, could have been effected at Mauritius for about £2,000, and in England for a less sum. The Policy contained a clause admitting the seaworthiness of the Ship at the inception of the risk, and the defendants did not seek to impugn the fact of her seaworthiness. The learned Judge in directing the Jury, told them that the Ship's seaworthiness at the time of the Hurricane was admitted; that the law stood, that if the expenses of repairing a Ship exceeded her value after repairs, it amounted to a Total Loss, and they must find for the Plaintiffs. The evidence on the part of the Owner had been, that the value would have been less than those repairs, and the Jury found accordingly.

The special clause in the Policy, admitting the seaworthiness of the Ship, did not affect the general issue: it was an unnecessary and ill-advised addition, and it has since been expunged from the printed Policy of one of the Companies; but no attempt was made to gain a verdict on the plea of the Ship having been unseaworthy when the risk began. In this way, indeed, it may have had a negative effect, by shutting up one branch of the defence: for, in other words, the Policy could not have been vacated on such a ground, as other Policies may be, even were the fact of unseaworthiness demonstrable. But the clause did not extend farther to the Insurers' disadvantage, and convert that into a claim against them which was no claim against other underwriters, or make them responsible for inherent defects, and natural decay, first discovered when a view was taken of those injuries sustained at sea, for which they admitted their liability. But to repair and replace the damages done by sea perils, so as to put the vessel into the exact condition she was in previous to the Hurricane is one thing; to restore her to a perfectly sound, stout, and seaworthy state is another. In the former process, Insurers stand by the terms of their agreement, and indemnify for those losses which they engage to make good:—by the second they would do far more; they would be putting the vessel into a better and more efficient state than that in which she had previously been; they would be rebuilding the frame, restoring a time-destroyed constitution, and presenting rejuvenescence to the veteran Ship, that for upwards of thirty years had traversed the waters of the ocean.

No discredit need be attempted to be cast on the truth of the estimate. It is possible that the sum named, or even a greater sum, might have been requisite at Port Louis to put in new timbers, to sheathe the vessel with new copper, and to perform every other repair that was desirable before she could be emphatically pronounced seaworthy. This is not the point; for the real question is, to what extent are the Insurers interested in that sum:—and farther, how are they affected if the alternative of selling the Ship in her then state be chosen in preference to entering upon expenses so great and extravagant.

Whatever a prudent, uninsured shipowner would do, such is the rule laid down is to be the course adopted by an insured owner: and no exception could be taken to the reasonableness of this rule as conclusive against the underwriters, supposing, what is not the case in this instance, *all* those expenses to have taken their rise from the sea perils encountered by the vessel, and which the underwriters insured the Owner against. But how different is the action of the rule when Insurers are *not* liable for all the damages requiring to be repaired:—how different is it when they are avowedly not concerned in causes which had a very material part in procuring the condemnation and sale of the Ship: how different is it to pay for consequences which are brought on ourselves purely by our own conduct or stipulations, and consequences which arise from the behaviour of others, never guaranteed by us, or from conditions the *onus* of which we never took upon our own shoulders!

This leads us to notice an expression which is, indeed, the same as was uttered by the Judge in the 'Roxelaine's' case, and from which, in the unqualified sense in which it was spoken, we must dissent. Serjeant (now Lord Chancellor,) Wilde said, "I can distinguish no difference whatever between an absolute Total Loss and the case where expenses would exceed the value of the vessel when repaired, called a Constructive Total Loss." We confess we see differences, and those material, between the two cases.

When a Vessel is lost by sinking or by fire, no doubts can be entertained of the fact: and although in many cases her destruction may be attributable to unsoundness, and other causes not touching Insurers, yet the proofs being lost, the question cannot be mooted. Not so, however, when expenses are built up till they reach the entire value of the thing insured; because in the latter case, the separate members and materials of this consuming expense may be defined, and some of them may be such for which Insurers are liable, some may be notoriously the reverse. So without denying that the thing is Constructively destroyed, the work of destruction may be shown to have been carried on by two or more hostile forces, and the exact proportions of their action may be distributed to each of such powers. The expenses *in cumulo* are indeed tantamount to the loss of the subject matter *in specie, but they are not, necessarily, tantamount to a Total Loss as regards the Insurers.* If certain perils undertaken by underwriters operate to one-fourth of the whole process of destruction, underwriters are certainly bound to that degree. If other defects operate to destroy the remaining three-fourths of the value, are Owners to cast off the *onus* of such operation, and to say, 'true, three-fourths of these mixed causes are attributable to us, and only one-fourth to you, nevertheless we abandon the concern to you, and we claim the Total Value, the same as if the whole four-fourths of Loss proceeded from the risks you insured us against by your Policy.'

It cannot be urged as strictly true what is sometimes said, that in a valid case of Loss it is indifferent to an Owner whether the Insurer completely restore the Vessel to her pristine state, or pay him the amount insured. Even here there is a difference, which an Owner will soon perceive, in favor of the Total Loss. If the Ship be repaired, at whatever cost, one-third is deducted from those repairs by the underwriters, and is paid by the owner on the score of amelioration to his property; whilst in paying a Total Loss no deduction is made for deterioration which the Ship may have undergone before she was destroyed: and although something might be said on this subject, the custom is a settled and convenient one, and both parties to the contract are perfectly agreed about the state of things as it exists. But if Owners, or Captains who act on behalf of Owners, were permitted, in cases of damage at foreign ports, the option of repairing or selling their ships, the advantages to the Owners attending the latter alternative are so well known that that course would constantly be adopted:—it being proverbial amongst Shipmasters, that next to a good voyage, a good Loss is most acceptable to their Owners. With

Fire Insurance Companies, the option remains with the office of rebuilding or of paying the amount of Insurance, and they select the way most economical to themselves, which can never be injurious to the assured if he be not over insured, and wishes to make an unfair profit out of the accident. That no such profit should accrue to the indemnified party in Marine Insurances is consistent with the Rhodian dictum, *Nemo debet locupletari alienâ jacturâ.*

In the case of the 'Sea Horse' the Insurers successfully resisted the claim for Total Loss, but as there were other strong grounds which weighed with the Jury in their decision, it need not be cited here.

In the thoroughly argued cause of the 'Alfred,' tried in 1848, before Lord Chief Justice Wilde, great stress was laid by the counsel for the defence, on the large sum that had been insured on the Ship, and on the freight, and on the temptation it offered for a Master to ingratiate himself with his Owner, by procuring a condemnation and sale of his vessel, by which so great and such immediate advantages would be obtained. For had the Ship been repaired, and the voyage completed, she would probably have been worth only one-half the sum at which she was valued in the Policy; besides, by a Loss the Owner comes into possession of his money without the trouble of transferring property in the usual manner. The whole case is very instructive, and embodies in itself the law up to the present time. There, it is clearly laid down not only that the absence of *bona fides* in the Master, and those concerned in the condemnation and sale of a Ship, is fatal at once to a claim on the Insurers for Loss, but moreover, that, beyond every thing being done, *optimâ fide*, it must be shown to the jury that the best judgment had been formed which the circumstances admitted, and which men of prudence and ordinary intelligence could have arrived at. It is true, indeed, that such men may, with all their discretion, judge erroneously as to results, but such erroneous judgment, if it were the best they could form as disinterested and prudent persons, is not to defeat the Owner's claim in his Insurance. A verdict was given by the Jury in favour of the Defendants,—the Insurers, both as regarded the Loss of Ship and Freight. There is a considerable advantage in a Loss on Freight. The law allows the insurable interest on this species of subject matter, to be the gross amount, although it is certain that a vessel completing her voyage in the usual way can only yield to her Owners a *net* sum, *i.e.* a sum given by the proprietors of goods for carriage of their merchandize, diminished by various expenses incidental to the working of the Ship, such as wages and victualling of the crew, port charges, &c. So that the interruption of a voyage at any point must be more profitable than the completion of that voyage, inasmuch as underwriters make no deductions on account of these expenses, but pay the sum insured. A loss on a Freight Policy is therefore an absolute gain to the Shipowner.

It will be gathered from what has been said, that insurers are exposed not only to the "Act of God," "King's Enemies," and so on, but beyond these to risks arising from human volition; voluntary actions of men, how, while they may desire to do justly and honestly, labour under a bias from which they can scarcely free themselves. Very much should all parties concerned remember what Lord Mansfield said in the analogous case of a claim for Total Loss on goods,—"the merchant cannot elect to turn that which, at the time it happened, was in its nature but a partial, into a Total Loss, by abandoning."—(Goss and Another v. Withers). And still greater caution needs to be exercised with a certain class of Insurances, in which an Owner insures against *Total Loss only*. Here clearly it is *aut cæsar aut nullus*, and there is every inducement to a dishonest Owner to make the worst of any accident which may happen to his vessel, and there is a strong reason why the judgment of an honest owner should be distorted. We should not forget the words of Justice Bayley, in Gardiner v. Salvador—"it must always remembered that there is no such head of Insurance Law as loss by sale." To which Sergeant Shee, after quoting these words, says, "That which in its own nature is not a total Loss cannot be converted into one by any act of the master."

Yet the subject does not rest here, and I think it most important to be observed, that, with all the conditions fulfilled that justify a sale of a Ship, the question will arise in legal phrase,—Is the Insurer concluded in a total Loss in consequence of such a sale? To which I answer, not always. I have previously spoken of those mixed causes which operate in the destruction of a vessel, and which, in certain cases, render it imperative to dispose of her at a foreign port. Now it may happen that all those conditions were observed, viz., a real necessity for resorting to a port of distress; real damage to the Ship; a difficulty of doing repairs; the difficulty or impossibility of raising money for the disbursements; *bona fides* on the part of the captain; prudence and intelligence both in him and the surveyors and tradesmen who examine the damages, and estimate the necessary repairs; a correct judgment, even, that the vessel was irreparable; the sale of the Ship; and yet, after all, the claim against the underwriters may not be for a Total Loss, but for a partial one. For it is very possible that sea-damage, age, rot, and other causes may combine, so that as a remedy for all, a sale may be the most judicious course that can be adopted. But a sale, whilst it removes difficulties, the greater part of which from their nature appertain to the Owners, and do not apply to the insurers, ought not to saddle them with a responsibility far heavier than the Owners incur. It may be that out of the whole real and probable expenses, one-fourth is all in which underwriters are concerned; yet by an abandonment and sale, those parties to whom the remaining three-fourths of the damnifying causes belong, seek to throw the *onus* of the whole on the insurers, and themselves escape scot-free.

A sale then is not conclusive, and distributive justice must decide in what proportions the loss is to fall upon assured and insurers. Tolerably exact estimates and calculations can be made from documentary evidence as to the amount of damage for which the underwriters is responsible, and the claim upon him as a *quasi* "Particular Average," just as if the ship had been repaired. The master's duty to the insurers "is no other than the duty of an honest servant of an honest employer to those with whom that employer has contracted.

Whether he proceeds to a sale or gives orders for repairs, he should carefully ascertain the amount of damage resulting from recent perils of the sea, and of damage attributable to other and older causes, preserving for the satisfaction of all whose interests may be affected by his acts, the evidence which will enable them also to distinguish the one from the other, and thereby adjust their respective losses."—(Abbott on Merchant Ships and Seamen. By Sergeant Shee).

Concerning the Proper Stamps upon Assignments of Policies of Insurance.

By C. J. Bunyon, Esq., M.A., F.I.A., Barrister-at-Law.

The new Stamp Act does not, as perhaps might have been expected, set at rest the much disputed question, whether the assignment of a chose in action requires an *ad valorem* stamp. The clauses in the schedule to the new act, upon which the question will depend, and which immediately follow the words "conveyance and mortgage," are word for word the same as those in the schedule to the 55 Geo. III., c. 184, and hence it will remain abstractedly in the same position as before. A strong opinion has been expressed that in every case of such an assignment, whether by way of mortgage or upon a sale, the *ad valorem* stamp is necessary, and assuming that the points depend upon the construction of the word property in the statute, it is argued that "whatever is dealt with as property, and is the subject of sale or mortgage, is property within the meaning of the act, and that the instrument by which the transfer is effected is chargeable with the *ad valorem* duty, unless expressly exempted."—(Tilsley, Stamp Laws, 248).

This opinion becomes of importance, as it may be presumed to be that of the new tribunal of stamps established at Somerset House; we now, therefore, propose to consider it in connexion with the decided cases, in order to ascertain, if possible, its correctness, and also the practical effect of the new enactment, and scale of duties upon the point in question.

In looking at the words of the statute, some surprise may be felt that there ever should have been any question in the case of a mortgage, the *ad valorem* stamp being required upon the "mortgage, conditional surrender by way of mortgage, further charge, wadset, heritable bond, disposition, or tack in security, and eik to a reversion *of or affecting any lands, estate, or property, real or personal, heritable or moveable, whatsoever.*" Upon these words it has been decided that any writing containing a contract to charge any property, real or personal, as a security, is subject to the *ad valorem* stamp; but upon the point in question it was objected that, upon the authority of Warren *v.* Howe (to which we shall hereafter have occasion to refer) and other cases, a policy was not property within the meaning of the act. When, however, the question was distinctly raised for the decision of the court in the late case of Caldwell *v.* Dawson, 14 Jur., 316, the result was, as might have been anticipated, that an *ad valorem* stamp was held necessary. In that case a policy was assigned by deed, as a security for a debt, which the borrower and his surety covenanted to pay; and Baron Parke observed:—"We are now for the first time called upon to put construction on this clause of the Stamp Act; and I think that this sort of instrument falls under the description of a mortgage affecting property within the meaning of that clause. The words of it are—'any mortgage of or affecting any lands, estate, or property, real or personal, whatsoever,'—language which affects every description of property, and it is impossible to deny that we are not fettered by previous decisions that a Policy of Insurance is not within its meaning."

In the case of mortgage, where the sum secured is less than £1,400, it is to the advantage of the public that the *ad valorem* stamp should be the correct one, it being, in such cases, less than the common deed stamp. Had a different decision been arrived at, the practical result, under the new act, would be the same where a deed is to be executed, as in such a case the deed containing, as every mortgage deed invariably does, a covenant for the payment of the mortgage money, would fall if not under the head of "mortgage," at least under that of "covenant," and thus be subject to the *ad valorem* duty, instead of the common deed duty as formerly.

Whether the *ad valorem* duty, however, is payable upon an assignment by way of sale of a Policy, seems to stand upon a very different footing. Here the words of the Act are,—"Conveyance, whether grant, disposition, lease, assignment, transfer, release, renunciation, or of any other kind whatsoever, upon the sale of any lands, tenements, rents, annuities, or other property, real or personal, heritable or moveable, or of any right, title, interest, or claim, in to, out of, or upon any lands, tenements, rents, annuities, or other property, that is to say, *for and in respect of the principal or only Deed, instrument, or writing, whereby* the lands or other things sold shall be granted, leased, assigned, transferred, released, renounced, *or otherwise conveyed to or vested in* the purchaser or purchasers, or any other person or persons by his, her, or their direction." Here then the *ad valorem* stamp is payable, not in respect of any writing containing the contract, but in respect of that Deed or writing by which the subject of the contract is conveyed to or vested in the purchaser. Thus, when the subject of the contract is real estate, the contract itself, not being a conveyance, will not require an *ad valorem* stamp, but an agreement stamp only; although upon its execution the purchaser will at once be entitled to an equitable interest in the property, and the vendor become seised in fee of the legal estate in trust for him. When, however, the subject of the contract is a chose in action, it is incapable of conveyance and is unassignable, and hence it is argued that, in the case in question, no *ad valorem* stamp can be required. Equity, it is said, will give effect to a contract respecting a chose in action by making the vendor a trustee for the purchaser of the legal right, and enabling the latter to bring an action in the name of the person in whom such legal right for the time being, may be vested,* and thus, as far as the nature of the case will admit, compelling a specific performance of the agreement, but no equitable interest passes in the subject of the contract, as is the case upon the conveyance of an equitable estate in real property. The distinction is a somewhat nice one, but it is argued that it is well known to all equity lawyers, and fully proved by the broad distinction made as to the operation of the transfer upon voluntary settlements by Deed of equitable interests in real estate on the one hand, and choses in action on the other the former being considered complete and irrevocable instruments, the latter incomplete and standing alone inoperative for want of valuable consideration. That, although the ordinary form of Deed purports to assign the policy, this is rendered immaterial by the rule that instruments are to be stamped according to their legal operation that, in the words of a strong advocate of the opposite view (Tilsley, p. 7), an instrument which in terms purports to effect a transaction, but which transaction fails by reason of something wanted to perfcet the instrument in the form proposed, is not subject to stamp duty according to its purports and intended effect, but may be liable according to its actual operation. Thus an instrument purporting to convey land, and containing a stipulation not to disturb the party in his enjoyment of the property, but having no legal operation as a conveyance, not being a Deed, was held to be chargeable with stamp duty as an agreement only.—Rex *v.* Ridgwell, 6 B & C, 665.

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* As any such person would be a constructive Trustee, within the meaning of the Trustee Act, 1850, it would seem that a Court of Equity will now be enabled by virtue of that Act to authorise a purchaser of a policy to sue thereon in his own name.

The current of the decisions appears for some time to have coincided with this view. Thus, in Warren *v.* Howe, 2 B & C, 281, there was an assignment by indenture of a judgment debt, in order that the plaintiff might receive the monies to be recovered on the judgment, and after payment of the expenses attendant thereon, pay himself the amount of a debt for which the indenture was given as a security; and the objection taken, raised the question whether the Deed was properly stamped with an *ad valorem* stamp of £1 10s. or required a common Deed stamp of £1 15s. It might have been expected that the case would have been referred to the general head of "Mortgage" in the schedule, hut it was argued that the instrument either fell under the term "conveyance," or under the description of a mortgage as being a "conveyance of property in trust to be sold, and intended only as a security." Lord Tenderden decided that it did not fall under either of these clauses, and referring to the words under the head of conveyance, already cited, held that the statute enumerating things the subject of conveyance and sale, and usually converted into money; the expression "other property," applied only to property of the same description, and therefore did not include choses in action.

Again, in the case of Belcher *v.* Sykes, 6 B & C, 234, in consideration of the payment of a sum of £50,000, a share in a partnership, the property of which consisted of Government contracts, was assigned by Deed to the continuing partner. It was argued that the *ad valorem* stamp was applicable, but the court, referring to Warren *v.* Howe, was of opinion that the subject matter of the contract between the parties was not property within the meaning of the Act.

On the other hand, it may be argued that a right interest and claim in and upon the policy is vested in the purchaser by the Deed, which interest, and not the legal right, is the thing intended to be transferred; that, granting the distinction between the voluntary conveyance of an equitable interest in reality, and the assignment of a chose in action, it is impossible to deny that a contract, supported by valuable consideration, will pass an equitable estate in the former as well as a conveyance, and that it is upon the form of a conveyance that the *ad valorem* stamp is imposed; that when there is a valuable consideration, it is the contract that transfers the property in either case, and that if nothing further passes under the subsequent Deed in the one case, and the *ad valorem* stamp is, nevertheless, allowed on all hands to be requisite, it would seem to follow that it should be so in the other.

In the later cases, a view not very different from this appears to have been taken, although there has never been a distinct decision upon the point in question.

Thus, in Horsfall *v.* Hay, 2 Exch. 778, the following document was held improperly stamped with an agreement stamp, "Memorandum, that A. B. has sold to C. D. all the goods, stock in trade and fixtures in the shop of E. F. at &c. for £90." It was held that it was a conveyance, and that as it was not within the exemptions to be found under the head of agreements as relating to the sale of goods, wares, and merchandise, but containing also the word fixtures, it was the record of an agreement, that from its date the purchaser should have full rights to receive the fixtures, and was therefore a transfer, and subject to the *ad valorem* duty, or that any instrument operating as the record of the transfer of property, was a conveyance within the Stamp Act; this is a strong case, but, nevertheless, clearly distinguishable from the case in question.

Again, in the case of Caldwell *v.* Dawson, already mentioned, Alderson, B., remarked, such an interest as is conveyed by this Deed, would certainly pass under the word property in a will; and if so it is strange to say that it is not property within the Stamp Act. In the case of Warren *v.* Howe, Lord Tenterden seems to have thought that the words of the schedule apply only to such property as could be transferred at law from a seller to a purchaser; whether that opinion is quite correct is not now the question before us, although it is difficult so to consider it, for equitable estates are sold as well as legal ones, and it is strange to suppose that the Stamp Acts were not meant to apply to such transfers. I think that the words of the schedule are not to be so strictly construed, for they speak of *right*, *title*, or *interest* in property, and impose a stamp upon any conveyance of such, and there can be no doubt but that this is such a conveyance. And Rolfe, B., after remarking that the case of Warren *v.* Howe did not decide the question before the court, added, "I own, if ever I should be the purchaser of a judgment debt, I should insist upon an *ad valorem* stamp."

This case, however, it will be remembered, was upon a mortgage transaction, and the decision was upon the mortgage clause. The writer has, moreover, been told by the counsel who argued the case in support of the rule, that upon the Chief Baron remarking (in the course of the argument upon the construction given to the word property, in the case of Warren *v.* Howe, and its bearing upon the point in dispute,) that the same word is always to be interpreted in the same manner, in the same act, it was pressed upon the court that the words in the mortgage clause were much more extensive than those in the conveyance, and that conceding the point in the construction of the latter, the word, "whatsoever," must be read as enlarging the meaning of the word property in the former.

If these latter dicta are to be considered conclusive, and overruling the prior decisions, the *ad valorem* stamp will in all cases be requisite, and in purchases for which the consideration does not amount to £300 will present the advantage of being smaller in amount than the Deed stamp of £1 15s., It is however submitted that the question is not yet beyond a doubt, and if so, in such small purchases a careful practitioner may still think it right to fix the larger duty, and may, at the same time, well hesitate before affixing a heavy *ad valorem* stamp in a more important transaction. In considering a question of this nature, it will always be remembered, that a Deed or other instrument does not in general derive any validity from the stamps affixed to it. Stamped or unstamped a conveyance or agreement will equally pass an estate, or be a binding contract. The effect of the Stamp Laws is simply to prevent any such document being received as evidence in a court of law or equity, until the appropriate stamps have been impressed upon it. When such stamps have not been impressed, either prior to the execution of the instrument, or within such limits as are appointed by the Stamp Act, a penalty indeed becomes payable, but the affixing of the stamps can be claimed as of right, upon the payment of the penalty, which, even under the new act, can in no case exceed the amount of £10 and double the amount of duty originally omitted to be paid; were it otherwise, a great injustice would be done, for in such a case a mistake in a stamp might result in the loss of the entire subject of the deed; and the property of an innocent purchaser be confiscated through an error of his professional adviser.

Foreign Intelligence.

FRANCE.—*Assurances upon the Lives of Others.*—The question, whether a party having no interest in the life of another, could effect an assurance on his life, had been discussed in a "Memoire," by M. Guinet, Avocat à la Cour d'Appel de Paris, and has since been settled in conformity with his views, by a legal decision in a case tried before the Tribunal de Commerce de la Seine. It is unnecessary to bring forward the particular features of the case. We will confine ourselves to quoting one or two of the leading arguments adduced by M. Guinet to prove that such assurances are unlawful. "Assurance," he contends, "is a preservative contract, its object being to guarantee each individual, distinct from others, against those accidents which may affect his present or his future circumstances. The assurer does not promise, however, the preservation of the actual thing assured. No human power could undertake such a guarantee. On the contrary, the assurer assumes that the thing assured may be either lost or destroyed, and he promises in such a case to represent it by an equivalent. Thus, if we look at the eventual fulfilment of his guarantee, the contract of assurance is a means of acquisition; since that must always be deemed an acquisition which is an actual transfer to the credit of an individual, of something which he did not hitherto possess; but since this acquisition only replaces a good which he had lost, it is not actual profit in itself. It is simply the act of placing him in the same position, in general, as if the unforeseen event had not happened."

"This distinguishing character of the contract of assurance is also its *essential character*. The assurer does not offer to the assured any gain or advantage whatever. He offers to him (and it is in this that the utility and the legitimate use of the contract consists) the continuance of the property and of the advantages which he now enjoys. This continuance is effected by the transfer to him of an equivalent, if the things which compose the property, or the advantages happen to disappear by one of those unfortunate events which occur suddenly, and beyond the course of ordinary probabilities. The assurer, besides the greater or less chances which he runs by reason of the greater or less degree of accuracy of his calculations, is, as it were, a compensator, who, after having reckoned the average of chances to which all earthly things are subject, brings together into his own hands the individual risks, receives from every one a kind of general contribution, repairs the disasters which happen to some in particular, and thus restores to all the equilibrium of their positions."

Again; "To stipulate for an assurance is to require a guarantee against an event which we fear. He who understands an assurance in a different sense, who desires to stipulate in the event of misfortune for anything beyond a restitution, makes a *wager* but not an *assurance*. To give such a name to his transaction would be both to abuse the word and the idea that it represents."

"All authors who have written on the subject of assurance are agreed, that a party to make a valid assurance on the life of another for his own advantage, must have an interest in the existence of that life."

M. Guinet then cites in favour of his opinion De Grün and Joliat ("Traité des Assurances Terrestres," p. 421), Quérault (translation of "Traité Anglais," p. 397), Alauzet ("Traité des Assurances," p. 180), and continues his arguments on the facts of the case to be tried. In the course of the judgment which was given by the court, the same kind of reason is adduced—"Seeing that the contract of assurance has for its object the restitution of a loss experienced by the assured; that in like manner as assurances against the risks of navigation, and against fire, the assurance which the father of a family effects upon his life, to preserve to his children the means of existence which he procured them by his labour, but of which his premature death may deprive them; and, lastly, that which is effected on the life of another party, when the assurer has a real and substantial interest in the continuance of that person's life, and which he may lose by his death, must be considered as important acts dictated by a sound prudence.

"But seeing that the contract of assurance is not intended to create a benefit in favour of the assured, it cannot be considered lawful if the said assured is not the possessor of the things which are the object of assurance, if he has no interest in its continuance, and has no object but gain.

"Seeing that this principle is in conformity with existing laws on the subject, particularly the regulations of art. 347 of the Code de Commerce, which declares null and void assurances upon *freight* and *profits to be realised* on merchandise in course of transport, and maritime profits on sums lent on bottomry.

"It follows, that an assurance on the life of another party, in the continuance of which not only has the assured no interest, but by whose premature death he may, on the contrary, acquire great gain, must be annulled as immoral.

"That, nevertheless, the premiums paid must be considered as deposits, and rendered back to the assured with the interest they produced.

"Seeing, that for the purpose of rendering these kind of transactions valid, it is vainly pretended to compare them with contracts for Life Annuities; although, since the Life Annuity is ordinarily the price of a thing advanced, that contract is authorized by the law in consequence of the necessity which many persons find themselves under, of procuring an augmentation of revenue, whilst the premium of assurance on the life of another, paid with the view of obtaining, after his death, a sum of money, can only be considered like putting into a lottery—a thing prohibited by law;" for these reasons, the Court declared the policies void, and decreed that the Company should repay the amount of the premiums with interest from the time when they were paid, and that the expenses of the action should be borne, one-third by the Company, and one-third by each of the two plaintiffs. The widow of the party assured was also a plaintiff, the company having declined to pay any of the claims on the further plea of concealment of facts; but as the decision in her case does not involve the points above discussed, we need not further allude to it.

Mercantile Guarantee Risks.—In the Institution "L'Union du Commerce," we find that the total amount of policies opened and subscribed for the year 1849, was 63,181,000fr. (£2,527,240) being for the department of the Seine alone, of which sum 30,582,670 fr. (£1,223,305) was made use of; that is, actual transactions took place to that amount, (and on these only the premiums are charged), which amounted to 179,214 fr. (£7,169). From this, had to be deducted the share of risk which the insurers themselves bore in the insurance, amounting to 51,533fr. (£2,061), in premiums; also the premiums paid in advance for 1850, 12,267fr. (£490), leaving a sum applicable to the casualties of the year of 115,414fr. (£4,617). Against this, the claims for losses incurred by the subscribers amounted to 56,280fr. (£2,251), leaving a balance for the reserve fund of 59,134fr. (£2,365). Further, a sum of 16,884fr. (£675) was expected to be recovered from bankrupts' estates: thus making a total reserve for the year 1849 of 76,017fr. (£3,041), equal to 135 per cent. on the claims and losses indemnified.

On reference to the Accounts of "La Securité Commerciale," we find the following statement issued as the position of the Company on the 31st May, 1850.

	£
Amount of insurances received from the commencement, as extending over the period of years for which the policies are granted	31,537,291
Amount of Insurances received since 1st of January, 1850	3,469,000
Annual amount of premiums	20,742
Premiums received on account of the year 1850	19,745
311 losses notified	6,780
Surplus of assets over liabilities	12,965

Of the yearly account of "La Societé Mutuelle," no balance sheet has been circulated, but from a paragraph which occurs in the annual report, it must be in a high state of prosperity, since it states, that but for some disagreement between the ex-director and the executive, the whole of the contributions due for 1849 would not have been required; that *one-half* would have sufficed from each subscriber. ("A review and synopsis of the Mercantile Guarantee Societies established on the Continent, practically applying the principle of insurance to commercial transactions. 1850").

The Assurance Magazine.—We are much gratified to find that the application of the principles of Assurance to so many varied subjects in this country, has been appreciated in France, and is likely to lead to a public-spirited rivalship, honourable to the character of both nations. It is also impossible not to feel flattered by the notice which this Magazine has there received, as the medium of conveying sound and novel information abroad, on topics hitherto confined to a very limited circle of readers even at home. We have been too content to use our experience, without recording it for the benefit of others. The compliment is of the greater value as proceeding from a talented writer, who has for many years, in the "Revue des Assurances," from which the following quotation is made, published original articles of great interest on the position and progress of Assurance Companies in France and other countries, and reports on the legal decisions to which the immense Fire Insurance business in France has given rise. This valuable publication has no doubt tended greatly to the interests of the companies; but not less to those of the public, by showing the practical benefits to which the system of Assurance has given rise, and which every extension of it serves only to prove with greater force. We trust that the good effects of unity and combination, which M. Dubroca so forcibly points out as raising the system of Life Assurance to its present important position, will not be lost sight of, and that the members of the Institute may be stimulated, by his remarks, to bring together in a spirit of generous emulation, the results of their individual experience, for the "improvement and advantage of all."

"Quand on entreprend quelque chose en Angleterre, c'est toujours dans des proportions gigantesques.—Les Assurances devaient naturellement participer de ce grandiose.

"Aussi les Companies sur la vie se comptent par centaine; elles exige une armée d'employés, qui par mille canaux differens portent l'Assurance dans toutes les familles, et les appliquent à tous et à tout.

"Les Assurances contre l'incendie, trop a l'étroit dans la Grande Bretagne, ont planté leur pavillon jusque dans la mer des Indes. Pas-une colonie qui ne soit guarantie par les compagnies Anglaises. Dans les factoreries du Céleste Empire, elles ont droit de cité.

"Quant aux Assureurs Maritimes on les appelle *les Guidons de la mer*; c'est le nom des premières ordonnances sur la matière.

"Le secret du développement de ces institutions, on le cherche dans les mœurs, les aptitudes, le caractére Anglais; c'est faire procéder la cause, de l'effet.

"Les causes réelles de cette prospérité, de ce developpement, sont les observations, les études, les efforts communs. Le *Lloyd* et *l'Institut des Actuares*, avec les séances, les publications, les correspondences que comportent ces associations, voilà le levier puissant qui a élevé l'Assurance à la hauteur d'une institution publique,

"Ces réflexions nous sont suggérées, par l'apparition d'une *Revue des Assurances*, que nous savions être en projét, et qui se révèle aujourd'hui au public. Le premier numéro, daté de Septembre, n'a pas moins de 120 pages, et contient des notices fort intéressantes que nous porterons à la connaissance de nos lecteurs."

GERMANY.—*Fifty Years' Experience of the Mecklenburg Hail Insurance Company.*—In November, 1847, the *Mecklenburg Hail Insurance Company*, at *Neubrandenburg*, celebrated, with becoming honours, the 50th Anniversary of its foundation. During the preceding half-century, its operations had been productive of so much benefit to the agricultural interests of the Grand Duchy, and of the adjoining districts, including part of the territories of Hanover and Prussia, that there existed a full justification of the pleasing enthusiasm evinced on the occasion above referred to, which was also chosen for the inauguration of the late Director's portrait, and for the presentation of a testimonial, subscribed for, in small sums, by upwards of 2,000 individuals, to Dr. Schrader, the actual Director or Manager of the Company.

The object of the present notice is to give a *précis* of the *Experience* of the Society, and we have no doubt that our readers will agree in considering it a desirable contribution to an important, but very imperfectly appreciated application of the principles of Insurance, and of a kind on which but few practical details can be obtained.

The Mecklenburg Hail Insurance originated in the suggestions of a landed proprietor named Von Müller. The Government appointed a committee of enquiry, consisting of the Count Von Schlitz and others, who entrusted the execution of the project to a Committee at Rostock. In the year 1796, the latter transferred its future administration to the care of those whose interests it was designed to protect, viz., the landholders and agriculturists, by which classes it has been conducted to the present day.

The members pay no premium in advance, but, at the end of each business-year, their total claims for damage by hail, inclusive of all charges and incidental expenses, are levied by a rate on the sums respectively insured under their Policies. For instance: on the 20th October, 1848, the Direction issued a notice to the effect that the losses to be defrayed arising from damage by hail, in the spring and summer of that year, amounted to about £19,200, to meet which it was necessary to levy a rate on the members, amounting to about £1·382 per cent. on the sum insured, which being about £1,384,410 in that year, would thereby produce the sum of about £19,132, leaving £68 wanting, the latter sum being payable out of surplus interest, on a certain reserve, provided by the Society's Statutes respecting fines. The members were consequently called on to pay at the Society's office at Neubrandenburgh, the rate or contribution of £1·382 per cent., or 1 thaler 9 gutegroschen and 2 pfennige per cent. *in cash,* within four weeks of the notice, and free of all expense to the Society, the *contributors* having to pay the stamp of 2 groschen on the official receipt.

In the annexed statement we have reduced the money of account (viz. 1 thaler = 48 schillinge = 576 pfennige) to its corresponding decimal value. It will be observed that it comprises the experience of 50 years on 2540 cases of damage by hail, amounting to nearly £215,000, being an average of nearly £85 to each case of loss.

In the first five years of the Company's existence, the proportion of losses to sum insured was the *most* favourable, and in the 8th quinquennial period—1832 to 1836—the *least* favourable. The *next highest* rate of loss was the period from 1807 to 1811, and the nearest approach to the latter was experienced in the last period, 1842 to 1846, which included, however, three years belonging to the most favourable of the Company's existence. The years 1845 and 1846 being heavily taxed, more than counterbalanced the effect of the three previous years, and it would be interesting to learn, with regard to the variations at different periods, whether the *distribution* of risks has been much altered during the Company's experience. The returns do not contain such particulars, but show that the Company congratulates itself on the results being more advantageous than in other institutions, taking into consideration that it insures its members against loss from damage by hail to *Oil-Grains,* and *Tobacco,* as well as to ordinary grains—a usual rate of premium in that country being 1½ and 2 per cent. on the two former, and ½ per cent. on the latter kinds; whilst the members of the Mecklenburgh Association have been insured in the 50 years from 1797 to 1846, at a general average rate of about ⅝ per cent.

Summary of the Amounts insured in the Mecklenburgh Hail Insurance Company at Neubrandenburgh, the Total Losses and Proportion per Cent., in each Year, from 1797 to 1846 inclusive.

YEAR.	Sums insured.	Total Losses including Expenses of valuing.	Proportion per Cent. to each Insurer.	YEAR.	Sums insured.	Total Losses including Expenses of valuing.	Proportion per Cent. to each Insurer.
1797	53,350	26·5	·052	1812	419,222	655·	·156
1798	62,336	458·5	·758	1813	440,214	412·7	·091
1799	99,482	44·	·047	1814	455,682	919·3	·219
1800	154,796	72·4	·047	1815	494,911	1607·5	·400
1801	197,700	410·	·210	1816	543,336	1924·3	·302
	567,664	1011·4	1·106		2,353,365	5548·8	1·168
Average ..	113,533	202·3	·221	Average ..	470,673	1109·8	·234
1802	249,857	2052·	·829	1817	656,643	3882·7	·588
1803	377,564	1042·2	·283	1818	860,097	3673·3	·430
1804	423,293	485·	·115	1819	1,005,182	2774·7	·278
1805	477,325	473·	·079	1820	1,102,896	3864·8	·346
1806	542,896	537·6	·079	1821	1,177,075	3414·1	.283
	2,070,435	4589·8	1·385		4,801,893	17609·6	1·925
Average ..	414,087	918·	·277	Average ..	960,379	3522·	·385
1807	560,725	700·9	·125	1822	1,219,464	6139·8	·493
1808	583,329	5164·8	·886	1823	1,218,418	11072·5	·880
1809	610,589	4833·8	·800	1824	1,170,768	1524·4	·130
1810	574,850	882·4	·125	1825	1,182,443	4680·4	·398
1811	576,661	7979·7	1·366	1826	1,116,850	2716·7	·230
	2,906,154	19561·6	3·302		5,907,943	26133 8	2·131
Average ..	581,231	3912·3	·660	Average ..	1,181,589	5226·8	·426

YEAR.	Sums insured.	Total Losses including Expenses of valuing.	Proportion per Cent. to each Insurer.
1827	1,082,279	4747·5	·420
1828	1,082,829	5256·9	·472
1829	1,126,414	2505·7	·210
1830	1,172,657	4798·	·385
1831	1,276,793	3157·4	·240
	5,740,972	20465·5	1·727
Average ..	1,148,194	4093·1	·345
1832	1,352,129	9219·1	·666
1833	1,354,429	18035·8	1·325
1834	1,284,282	10705·1	·833
1835	1,243,336	3103·9	·216
1836	1,265,682	6516·9	·500
	6,499,858	47580·8	3·570
Average ..	1,299,972	9516·2	·714
1837	1,289,232	6649·5	·500
1838	1,287,496	4835·5	·357
1839	1,335,007	16303·8	1·216
1840	1,423,014	2812·6	·194
1841	1,286,300	2335·4	·176
	6,621,049	32936·8	2·443
Average ..	1,324,210	6587·4	·489
1842	1,308,925	2002·8	·152
1843	1,359.586	5308·2	·385
1844	1,439,382	4122·2	·278
1845	1,445,921	16427·2	1·125
1846	1,393,946	11490·3	·820
	6,947,760	39350·7	2·760
Average ..	1,389,552	7870·1	·552
TOTAL....	44,417,083	214788·3	·430

In 50 years the sum of £215,000 was thus levied, by contributions amounting *in the aggregate*, to 21·5 per cent. for the whole term, being an average for each year of nearly ·43 = 8s. 7d. upon each hundred insured.

The number of claims made good in the 50 years, amounted to 2,540. The average of each loss was therefore about £85.

The Mecklenburgh Hail Insurance Company is the oldest and first established institution of the kind in Germany. The earliest of the other existing establishments dates from 1818. Some of the first Mutual Offices met with disastrous results—for instance, the "Erste deutsche Hagelversicherung," founded at Cöthen in 1812, was forced to dissolve some twelve years afterwards; having, it is said, required in the years 1822 and 1823 contributions from its members, to meet losses, amounting to 2·5 and 5·083 per cent. on the sums insured. In 1823 also, the Halberstadt Society discontinued its business for nearly similar reasons.

The sums insured against Hail, by the latest returns that could be procured in 1844, were, according to Masius, (see his "Lehre der Versicherung," Leipsic 1846), as follows:—Cassel Company, £434,980; Cöthen Co., £200,218; Detmold Co., £78,766; Greifswald Co., £389,825; Greussen Co., £759,998; Hanover Co., £834,720; Kiel Co., £344,194; Leipsic Co., £1,266,106; Munich Co., £177,095; Neubrandenburg (or Mecklenburg) Co., £1,439,382; Schwedt, Co., £1,617,296; Stuttgard Co., £624,393.

The preceding are on the system of Mutuality; the only Proprietary Company was the Berlin, which insured in that year the sum of £2,067,800.

The aggregate amount insured by the 13 offices in or about the year 1844, was therefore, £10,234,775. The results of the *year's* operations, contained in such Reports as were obtainable, are as follows for 10 of the Companies, being the proportion of "Damage from Hail," and expenses, to the whole amount insured:—Berlin, ·343 per cent.; Cassel, ·597 per cent.; Detmold, ·523 per cent.; Greussen, ·707 per cent.; Hanover, 1·093 per cent.; Leipsic, ·45 per cent.; Munich (for 1843), 2·01 per cent.; Neubrandenburg (or Mecklenburg), ·287 per cent.; Schwedt, ·447 per cent.; and Stuttgard, 1·443 per cent.

It appears, from the work of Herr C. A. Masius, before quoted, that the damage from Hail-storms, in the year 1839, was so great, that but few of the Mutual Hail Associations could pay their losses *in full*, and that in the same year, the losses of the Berlin Proprietary Company amounted to £30,502, *in addition to* the premiums received in the year on insurances, to the extent of £2,022,228. The extra loss was paid out of their capital of half a million dollars, (or about £71,428), which capital was some five or six years subsequently restored to its original amount, out of the more fortunate business results of those years. The late King, Frederick William III., was a shareholder in this Company, to the extent of 100,000 dollars, (about £14,285), all benefit from which, as well as any profits that might arise, he renounced for the use of the Company in adverse years; and, singularly enough, the year after this liberal concession produced the great loss above adverted to! In 1838, the Company published a Record of its 16 years' experience; in the first period, of 8 years from 1823 to 1830; and in the second period, of 7 years from its re-organization in 1832 up to 1838. In the fifteen years there was a balance of loss in seven, and of profit in eight years. The general balance of the fifteen years' results, shows a profit of no more than £10,672 on a total sum insured of £23,591,521. If to this be added some returns extending to 1843 inclusive, it will be found that the general results for twenty years, indicate a profit of but little more than £19,000, or about £950 per annum; and, taking into consideration, the deficit of interest to shareholders in some of the years, it is evident that scarcely any profit, if not actual loss, had arisen to the year 1843. Such were the results upon premiums of in no case less than from ·75 to 1·5 per cent., and upon a total amount insured in 20 years of about £33,099,000, in 12 or more districts entirely situate in the Prussian dominions.

DENMARK.—*Results of the Government Insurance against Fire in the* 17 *years* 1827 *to* 1844.—In page 70 of the *Assurance Magazine*, are given the rates of average premium required by several Continental States. From particulars quoted in the "Allgemeine Versicherung Zeitung" for 1847, we are enabled to give the following abstract as the comparative result for *Denmark*:—

"The sum insured on *Town buildings* increased from £3,122,857 in 1827-8, to £4,457,142 in 1844, nearly 42·7 per cent. in about 17 years. The average losses during the 17 years, amounted to about £1 16s. per £1000, or 2s. 4d. per cent. The sum insured on buildings *in the Country* increased from £14,980,000 in 1827-8, to £18,928,571 in 1844, about 26·36 per cent. in the 17 years. The average losses thereon amounted to about £1·875 per £1000, or 3s. 9d. per cent."

It will be noticed, by turning to the Belgian Ministers' Report above referred to, that this ratio of losses is precisely the same as the average premium charged in Bavaria by the Government, and is the mean between the highest and lowest rates as enforced by other Governments. The losses given in the same report, as experienced amongst seven of the principal Fire Insurance Companies in Belgium, were £26,881 on a total sum insured of £57,128,424, being only £·47 per £1000, scarcely one fourth of the average in Denmark.

POLAND.—*Fire Insurance by the Government.*—A journal of St. Petersburgh, in presenting the government accounts of the Administration of the Kingdom of Poland, contains the following particulars respecting the Insurances against Fire undertaken by the State. The total value of buildings insured is thus subdivided:

In Towns..........	42,603,232	Roubles	= £6,568,000
In Country Villages	61,156,886	„	= £9,428,400
Total	103,760,118		=£15,996,400

being £388,870 more than was insured in 1844. The number of fires has been 196 in towns, and 1505 in country villages. The total sum disbursed in losses, amounted to 560,880 roubles = £86,469, and which, divided amongst 1701 cases, represents an average of very nearly £50 16s. for each loss. The proportion of loss to the total sum insured, has been about 5·40 per 1000, being nearly six times as great as the full average premium charged by the French Insurance Companies, not for buildings merely, but for all classes of risks, including manufactories and "contents" of a hazardous nature.—(Revue des Assurances.)

MISCELLANEA.

The Mortality of the Scottish Widows' Fund and Life Assurance Society, 1815 *to* 1845.—The records of the Scottish Widows' Fund, (first Life Assurance Society established in Scotland, and now, in point of business, inferior to scarcely any in England), contain a list of 642 deaths which have occurred, from the institution of the Society in 1815, to the period of the last investigation at the close of the year, 1845.

The total number of the assured, amongst whom the deaths have taken place, (exclusive of those whose policies have been either surrendered or forfeited), is 5,989. Of these, 5,542 were males, and 447 females; of the females, 365 were married, and 82 unmarried.

Adhering to the arrangement adopted by the Registrar-General, which is likely to be followed in all future Mortality Tables, the deaths may be classed under 12 heads, which, with their numbers, are as follows:—

	Causes of Death.	No.	Per cent. to Total Deaths.
I.	Epidemic and Contagious diseases	93	14·48
II.	Diseases of uncertain seat	52	8·10
III.	Diseases of the brain and nerves	133	20·72
IV.	Diseases of the respiratory organs	152	23·69
V.	Diseases of the heart and blood-vessels	53	8·26
VI.	Diseases of the organs of digestion	77	11·99
VII.	Diseases of the urinary organs	23	3·58
VIII.	Childbirth, and diseases of the Uterus, &c.	5	·78
IX.	Diseases of the joints	3	·47
X.	Violent deaths	18	2·80
XI.	Old age	6	·93
XII.	Causes not specified or ascertained	27	4·20
	Total	642	100·00

Of the first class, the greatest mortality arises from continued fever; 54 out of 93 deaths of which the class is composed, or upwards of 8 per cent. of the gross mortality, being ascribed to this cause. Of the 54 deaths, one-sixth part occurred amongst members of the medical profession, an experience which justifies the caution the Board has lately exercised, when called to consider the proposals of medical men, who have not previously passed through the disease. Of the remaining number, 3 are recorded among the clergy; a profession exposed in some measure also to the risk of contagion; and only one instance in the case of a female.

The deaths which occurred at different periods of age, (of which the deaths by each class of diseases are given at each period of age in the Table), are—

Ages.	Deaths.
20 to 30	28
30 „ 40	109
40 „ 50	143
50 „ 60	143
60 „ 70	123
70 „ 80	57
Above 80	12
Not classed	27
Total	642

[We have added the proportion per cent. of deaths by the different classes of diseases, from Mr. Neison's article, before quoted, as he avails himself of Dr. Begbie's paper, to make a comparison with the deaths from similar classes of diseases observed in the Gotha Life Assurance Company, in Germany.]—(Observations on the Mortality of the Scottish Widows' Fund, and Life Assurance Society, from 1815 to 1845. By James Begbie, M.D., F.R.S.E., Consulting Physician of the Society. The Monthly Journal of Medical Science, Jan. 1847).

Intensity of Diseases at different periods of life.—In the decennial period of age, 31—40, the greatest rate of mortality has taken place from "Pulmonary diseases;" next, from "Fevers;" then, from "Local inflammations;" "Abdominal diseases;" "Apoplexy;" and, least of all, from "Dropsy;" and in the next ten years of life, the mortality of these diseases follows the same order as to their intensity. In the term of life, 51—60, however, the following is the order in which the same six diseases stand, as to intensity:—apoplexy, fever, pulmonary diseases, inflammations, dropsy, and abdominal diseases. And in the ten years, 61—70, the order is again varied, being—apoplexy, inflammation, abdominal diseases, fever and dropsy equal, and pulmonary diseases at the bottom of the scale; and in the most advanced form of life of the preceding abstract, the following is the order of intensity of the diseases:—apoplexy, inflammation, fever, abdominal diseases, dropsy and pulmonary diseases. The following arrangement may perhaps exhibit these results in a more simple form:—

Diseases arranged according to the order of their intensity at the following terms of life:—

31—40.	41—50.	51—60.	61—70.	71—83.
Pulmonary diseases.	Pulmonary diseases.	Apoplexy.	Apoplexy.	Apoplexy.
Fevers.	Fevers.	Fevers.	Inflammations.	Inflammations.
Inflammations.	Inflammations.	Pulmonary diseases.	Abdominal diseases.	Fevers.
Abdominal diseases.	Abdominal diseases.	Inflammations.	Fever. }	Abdominal diseases.
Apoplexy.	Apoplexy.	Dropsy.	Dropsy. }	Dropsy.
Dropsy.	Dropsy.	Abdominal diseases.	Pulmonary diseases.	Pulmonary diseases.

Pulmonary disease is, therefore, so far as the preceding facts are concerned, essentially the disease of highest intensity in the destruction of life under 50; and above that age, apoplexy; the other diseases maintaining varying but intermediate positions in the scale of mortality.—(Mortality of the Provident Classes in this Country, and on the Continent. By F. G. P. Neison, Esq.—Read before the Statistical Section of the British Association at Edinburgh, 5th Aug., 1850.)

Risks from Gunpowder in Liverpool.—The attention of the commercial classes of Liverpool, as well as of its residents generally, has lately been awakened to an alarming contingency. Within a mile and a quarter of the docks there are magazines containing 16,767 barrels, or 721 tons, of gunpowder—a quantity far larger than is believed ever to have been accumulated before in any one spot. These buildings are not fireproof, they are without the means of ventilation, except by leaving the windows and doors open, and are not even provided with a lightning conductor. So complete, indeed, is "the resignation to chance and good fortune," to use the words of a recent report by a Government officer, that no guard by night patrols the place to protect it from robbery, or to give an alarm on the first outbreak of fire in the neighbourhood. The sensation created among the owners of property in Liverpool by these revelations may easily be imagined. The effect of an explosion of such a quantity of powder cannot be estimated, but it is generally believed that it would ruin the shipping and the town, and destroy thousands of lives. An explosion at Leyden of about a fiftieth part of what is deposited at Liverpool is said to have blown down 400 houses, and there are many other examples which leave little doubt as to the excuse in this case for the most extreme apprehension. It appears also that about 40,000 barrels are delivered yearly from the magazines to boats on the river, that the wheels of the carts which convey them have tyres of iron, that the horses are shod with the same metal, and that sometimes powder is sprinkled from leaky casks as they go along. Two or three years ago a house was burnt down within 50 yards of the magazines, but the wind happened to set in an opposite direction. Recently a house was struck by lightning in their neighbourhood, and it has more than once occurred that when cotton warehouses have been burnt down lighted flakes have been blown over and beyond them. The Government, on the matter being represented, have expressed the greatest surprise, but the *onus* of providing a remedy rests, in their opinion, with the Town Council. That body, it seems, granted in 1842 a new lease of the premises for 45 years to the parties by whom they are occupied, and who have converted them into a monopoly, as these are the only magazines where an unlimited supply is allowed to be stored, that privilege being permitted to Liverpool on account of its being a great depôt for the African as well as for the home trade. The Council did not stipulate that the premises should be open to all traders upon equal terms, and hence compensation is demanded by the existing holders, such as is not likely to be small in amount, as their profits are estimated at £10,000 a year from the monopoly alone, which, it must be remarked, adds further to the danger of the town by causing an illicit trade in the article to be carried on in unauthorized places, under every possible disguise, in and around the docks and quays. On the other hand, it is believed that the evil might be met, and the parties dispossessed, by indicting them as a nuisance, but obstacles could be opposed to the proceedings, which would cause a delay of a year or two. Under these circumstances, and after a fruitless interview on the subject, the Town Council are of opinion that no arrangement can be effected without an act of Parliament. Meanwhile, the 400,000 inhabitants of Liverpool are existing in daily consciousness of their peril, and it is felt that something should be done immediately. The case is one to call for some direct step on the part of the Government, although the rights of all parties might be reserved. At the same time it may be well to suggest to the lessees who now stand upon the letter of their claims, that supposing they could be legally driven out in two years, their demand for compensation should be limited to that period, and that it may also be well that they should ask themselves the question whether the law would be wholly powerless to reach them in a more serious way, if, after the warning that has been given of the consequences that are now within possibility, any accident should arise by which either human life or property might be destroyed.—(*Times* City Article, Dec. 6, 1850.)

Marine Insurance in 1693.—"Assurance is, when you are in any manner of fear of the ship your goods are in, or the danger of the voyage, or of pirates, &c., you then are willing to give another man a certain sum of money to put himself in your place, and if any danger arises, to pay you for the same goods the value that you have assured. It is a thing hath been long in custom and use amongst traders, and was established by a law under *Claudius Cæsar*, before the birth of our Saviour *Christ;* it hath been much practised in all trading nations, and is a cause of great increase of trade, because that hazard is borne by four or five with mutual consent, which otherwise must fall upon one person. The nature of it is thus; suppose you ship £300 of goods for Jamaica, you being unwilling to run so great a hazard yourself; you go to the *Assurance Office* behind the *Royal Exchange in London*, and there acquaint the clerk you will ensure £200 or £250, or if you will, the whole £300, (for you may ensure the whole or any part) upon such a ship for so much goods you have on board. The clerk presently speaks to other men that are merchants, that make it their trade to ensure, and you agree with them at a price so much in the hundred, and this is called *Primo*; the man that is your insurer runs all the hazard that can be imagined until your goods arrive safe at *Jamaica*. Before you pay the *Primo*, you have a Policy of Insurance signed by the man or men you agree withal, for you may deal with two, three, or four, to underwrite for you several sums. This Policy of Insurance ought to be copied in the office of Assurance, in a book kept there for that purpose, and for which you pay a certain sum unto the clerk or clerks sitting at that time. In the Policy is expressed the name of the person that causeth himself to be ensured, the place he ensures for, the ship, the master's name, the sum of money, the dangers you are ensured from, and how long that lasteth, with the name of the party or parties, that ensure or underwrite the Policy for you."—(Leybourn's Panarithmologia. 1693).

Advice to Choose Honest Insurers.—"Those Assurances are most dangerous when they are thitherwards inserted lost or not lost, which is commonly done when a ship hath been long missing, and no tidings can be had; the *Premio* (especially in time of war) will run very high, sometimes 30 or 40 *per cent.*, and though it happens at the time that the subscription is made, the ship is cast away, yet the Assurers must answer the loss to the Insured.

"But if the party that caused the Insurance to be made saw the shipwrecked, or had certain intelligence, such subscription will not oblige the same, being accounted meer fraud.

"So likewise, if the Assured, having a rotten vessel, shall assure upon the same more than she is worth, and afterwards give orders, that, going out of the port, she should be sunk or wrecked, this will be fraudulent, and not oblige the Assurers to answer. So soon as you hear of a certain that a loss has happened, you must enquire at the office for the Insurers (if you know them not), and acquaint them of the loss, and how you came to know it, and desire them to inform themselves of the truth of it if they please, and are not satisfied with your report. When they are satisfied there is a real loss, there is generally an abatement of 10 *per cent.* for prompt payment; for if they are punctual men and value their reputations, they will presently pay you; if not, they will shuffle you off, and endeavour to find out flaws, and raise scruples for a larger abatement than ordinary, and sometimes will keep you a year or two out of your money, and many times never pay; but generally get, in case of loss, 15 or 20 *per cent.* abated; I have known 40 *per cent.* abated on very small pretensions, which makes a common proverb about such insurers:—*What is it worth to insure the Assurers?* Be careful, therefore, to deal with honest men that value their reputation, when you have anything to be Insured."—(Ibid).

The Interest of the Insured in Marine Insurances.—"The original design of making Insurance on shipping, was, undoubtedly, no more than a general indemnity against the perils and dangers of the sea, and being confined within the bounds of that intention, is of great encouragement to trade and navigation, and in that point of view it has been treated in all countries where commerce has flourished as a matter of the highest importance, and almost everywhere, except in Great Britain, is subject to ordonnances and regulations fixing and ascertaining the limits thereof.

"But the best institutions are often liable to be applied to the worst purposes; there is no case which affords more instances of this kind than that of insurances, especially in this country, for there is no other where an Insurance on *no Interest* is not prohibited.

"The permitting this absurd species of Insurance upon *no Interest* to gain ground here, hath been the introduction of all those fraudulent practices, by which so many ships and cargoes have been wilfully lost at sea.

"It was about the time my Lord Somers held the Great Seal, that Insurance, *Interest, or not*, first appeared; but then the Court of Chancery could not conceive upon what principle, either of Law or Equity it was, that a recovery of a recompense in damage, for a loss not sustained could arise, and therefore vacated an Insurance, because it appeared that it was made upon *no Interest;* but afterwards means were found, under suggestions of advantage to the trade of the nation, to bring the Law to acknowledge a validity and force in that which before was esteemed absurd and nugatory; and thus the Policy of Insurance, *Interest, or not*, became established.

"Soon after this, the making of Insurance vastly increased, for gamesters, wagerers, and cunning fellows who pretended to deal in speculation, began to be almost as much concerned as the merchants; so that a Policy of Insurance in a short time acquired rather the effect of a box and dice, than a contract to secure trade. And as gamesters seldom play fair after a few of the first games, it was not long before foul play in Assurances began to appear, and which has ever since continued increasing, insomuch that now it is almost as common to hear of a wilful and fraudulent, as of an inevitable loss at sea.

"Practice and experience are the great lights of business, without which it is not known what things may be made to bear; though *speculative* Insurance, under the direction of proper intelligence, and other useful helps, was become a considerable branch, and carried on without employing any other money or stock than the Premios of Insurance; yet experience disclosed, that as all those

Insurances were to be made on the ship only, the care of a cargo might sometimes obstruct the *beneficial* loss of a ship, and keep Insurance upon *no Interest*, within narrower bounds than otherwise it would be, if ways could be found of profiting by the loss of the cargo, as well as by that of the ship; for hitherto Insurance on goods could not be otherwise made than upon their value.

"This introduced another new species of Insurance called a *Valued Policy*, whereby the Insured might value his interest at £1,000, though it was not really worth so many shillings, and no other proof was to be required than the production of the Policy; so that now by insuring *Interest, or not*, on the ship, and valuing the goods at ten times their worth, nothing can happen so much to the disadvantage of the Insured, as the arrival of the ship and cargo, a circumstance affording small hopes of safety in such adventures, but it is the state into which the business of Insurance is brought, by leaving the door of fraud wide open; for the frauds of the Insured, in common estimation, are almost equal in risk to any other peril usually insured against, especially in time of war, when colourable captures are easily contrived by entering into confederacies with the enemies of the nation, a practice of which instances appear almost every day. Under these circumstances it is, that this great branch of trade, called Insurance, which hath been accounted so valuable, is now esteemed, upon the whole, rather a losing than a beneficial part of business.

"The making Assurance in such manner *as manifestly interests the party Insured in a loss*, is a thing on the first view appearing so dangerous, that one would think it impossible to be endured. It is so far from being tolerated in any other country, that there is no State in Europe, where Insurance is used, that hath not expressly prohibited the making it beyond the Interest of the party under severe penalties, such as confiscation of goods, or corporal punishment, as appears by the ordonnances of *Fountainbleau touchant la Marine*, and also those of many other places. And by a late Act of Parliament, intitled, *An Act to regulate Insurance on Ships*, &c., it is enacted that no Insurance shall be made after the 1st of August, 1746, on any ship belonging to his Majesty, or any of his subjects, *Interest, or no Interest*, or without *further proof of Interest than the Policy*, by which the sense of the Legislature here seems to be declared, that Insurances of that nature are unlawful, and ought to be prohibited; but it is conceived that Statute is not sufficient effectually to answer the end proposed, though it has gone a good way towards it.

"An effectual and absolute prohibition therefore of all Assurances whatsoever, upon *no Interest*, or for more than the real Interest of the Assured, is still wanting; for such a prohibition would manifestly tend *to prevent frauds, restore fair dealing, preserve the Marine, encourage Insurance*, and, finally, to support and maintain trade and commerce in general."—(An Essay to Prove that all Insurances on Ships and Goods at Sea, beyond the Interest of the Assured, ought to be Prohibited.—By a Merchant. 1747.)

Whether it be Nationally Advantageous to Insure the Ships of our Foreign Enemies.—"It deserves solemn attention, that our insurers, in reality, oppose all the efforts of the state to destroy our enemies; for, whilst our Admiralty is designing the total capture of the French ships, and exerting the maritime force of the nation to ruin the French commerce, our insurers step forth, and agree with the French merchants to guaranty their commerce; and that their loss shall not exceed 15, 20, or 33½ per cent., or whatever is paid for the premium, from both the sea and our captors. So that they actually intercept the blow meditated by the Government against our enemies; and, upon a certain bribe being paid to themselves, place the French commerce in a state of security.

"Put the case, that the French have entirely insured any of their outward or homeward-bound fleets, as their late St. Domingo fleet is supposed to have been, at any premium, as suppose 20 per cent. upon a medium. Imagine now, that the British ministry, or Admiralty, by the interception of a French pacquet, or by any other intelligence, are informed that the rendezvous of the whole French fleet is to be in a certain latitude; and that a squadron of British men-of-war may be so stationed, as to be morally certain of *destroying* or *taking* the whole French fleet. An event of this sort will shine in the Gazette, and be celebrated with public illuminations. But what will be the consequence? It is evident, that if the French fleet be *destroyed*, our insurers are responsible for it to the French; therefore, in the case of the *destruction* of their fleet, even upon a fair insurance, we shall have the value of all this fleet to pay to the French, towards which our insurers have only received one-fifth part for the *premia*: whence it appears, that there will be a clear loss to the British nation of four-fifths of the value of the whole French fleet, from this event.

"But suppose that the French fleet, instead of being *destroyed*, is all *captured*. Our captors then gain the whole from the French, and the French recover again four-fifths thereof clear from our insurers. So that, upon the whole, we acquire only one-fifth part of the value of this fleet, or the *premia*, which we should have acquired if this capture had not happened. Thus, upon the supposition that the whole French fleet is *insured*, we shall neither gain or lose by the *capture*; therefore, the destination of our squadron to this expedition, *at the best*, will be absolutely useless; and the public treasure and strength, in money and ships, and men, to the amount of perhaps £200,000 or £300,000, will have been all wasted and squandered away, to no purpose, upon this event.

"It is, therefore, high time for serious enquiry, whether, under the present *practice of insuring* the French ships, the greatest part of our public naval expense, so solemnly provided, and appropriated by the legislative body of the nation, may not, upon many occasions, be fruitlessly directed; for, *after French ships are insured here*, it is ridiculous to employ our maritime strength in *taking* them, since then *all* the *loss* will fall upon *our own insurers*. It is, indeed, certain, that the *more* of our enemy's ships we take, the *higher* the *premia* will be raised upon them in *future* voyages; and, consequently, the greater deduction will be made out of their *future* profits. But in regard to a *present voyage* which is *insured*, the *premia*, having been fixed and paid, are not at all affected by the capture. And after any fleet of French ships have been here *insured*, the success of our naval force in *destroying* that fleet will be our national loss, to the amount of the whole *clear capital*, and our *capture* of that fleet, though accomplished with great expense, will be entirely insignificant to us, upon the balance of the accounts of our insurers."—(Essay towards illustrating the Science of Insurance; wherein it is attempted to fix, by precise calculation, several important maxims upon this subject; to solve various problems, and cases of contest; and particularly to balance, whether it be nationally advantageous to insure the ships of our foreign enemies.—Addressed to the Right Hon. Henry Pelham, Esq. London, 1747.)

Corpulence in Connection with Life Assurance.—"The amount of fat required for the full and perfect resistance of the body, is different, as aforesaid, in different individuals, and will also vary according to their mode of life. Thus, a man of letters will require less than a soldier, a soldier less than a prize-fighter. It is impossible, therefore, to fix any absolute standard of weight, and it is incorrect to look upon the average weight of healthy individuals in proportion to their height, as necessarily the proper one for every person. Still, there are certain limits on each side of the average, the transgression of which shows a predisposition to disease, or even itself constitutes infirmity. If a patient is below the boundaries of healthy thinness, there is a strong presumption in favour of some cause existing which may account for his emaciation, and will tend to shorten life; and, if that cause exists, he is, from the deficiency of fat, less able to resist its influence. If he is above the standard of healthy corpulence, the natural defence becomes a burthen; he loses the power of resistance which was derived from the normal proportion being kept between the various tissues; the balance, in fact, of the system is destroyed. Can we wonder at this, when we reflect on the vast aggregate amount of capillary vessels distributed through the adipose tissue, and think that these are doubled or trebled in quantity in obesity? Can we be surprised that the individual becomes thus more liable to such diseases as arise from this defective balance; that he is prone to heart-disease, to apoplexy, and congestions?

"The development of fat I consider an element of great practical importance in calculations of the value of human life. It is of the more importance, from the facility with which it may, in all but exceptional cases, be reckoned by the weight in proportion to the stature. In our species, the bulk of the frame is pretty accurately shown by the height, and consequently the quantity of fat which ought to be attached to that frame may be calculated. Its deviations from the normal proportion may, therefore, easily be arrived at, and can hardly be denied to lead to very valuable conclusions. What can add more to that examination which has resulted in the discovery of no disease, than to find that the weight is such as the healthiest usually possess? while, if a person is much above or below the standard, it is not necessary to discover any other bad symptom to pronounce the insurance of his life as above the ordinary risk. Were we confined to the observation of one single fact, by which to appreciate the probability of future illness, I do not know any which would teach us more than this; and when we have means of learning other circumstances, there is none which opens the ground better for investigation. If, for example, a proposal be sent from the country, backed merely with the opinion of a referee whom we do not know, that "no signs of disease are discoverable," and that "the proposer has a robust appearance," our knowledge of the tendencies of his constitution is small indeed. But if to this it be added that he is five feet eight inches high, and weighs eleven stone, we feel a certain degree of safety in accepting him. But should his weight be seventeen stone, a probable deposit of fat in the omentum and the heart occurs to us,—disturbance of the abdominal circulation, apoplexy, &c., are suggested, and the liability to these balanced and inquired about. A corresponding deviation from the natural weight, in the other direction, would, in a similar manner, lead to a more detailed examination of the chest, and a calculation of the possible existence of tubercle. When we remember that four-fifths of the losses at insurance offices arise from apoplexy and consumption, the safety which they would gain by the simple observation above mentioned is obviously very important to those engaged in such enterprises. I may add, too, it facilitates much the explanations of the reasons for a refusal or acceptance, which the directors will sometimes require from their medical advisers; for it depends on a reasoning comprehensible to all, and capable of reduction to figures; so that we are thus enabled to follow the advice of the wise man of old, which bids us "deliver all things in number," and can avoid the vagueness of a mere negative opinion.

"Height and Weight.—I put, therefore, a higher value than the modest author does upon a table which he gives in that paper of average weights in proportion to height, and think that our practical deductions would not be affected by the difference, if the average were taken from all the adult males in the United Kingdom, instead of the 3,000 cases he has collected. For an average, however large, must never be taken for more than it is worth, and should be rather a guide to knowledge than knowledge itself.

"Dr. Hutchinson's table gives, as I have said, the mean weight, at various heights, of 5,000 healthy men, but he thinks it better, for practical purposes, to exclude the extremes of stature, and, in a broad sheet for the use of insurance offices, has inserted another table, of which he has kindly furnished me with a copy. In this the heights of men, between five and six feet only, are collected to the number of 2,650, and that is the one I shall take as the standard of mean healthy weight. The table is as follows:—

HEIGHT.		WEIGHT.	
Feet.	In.	Stones.	lbs.
5	1	8	8
5	2	9	0
5	3	9	7
5	4	9	13
5	5	10	2
5	6	10	5
5	7	10	8
5	8	11	1
5	9	11	8
5	10	12	1
5	11	12	6
6	0	12	10

"The individuals on whom these observations were made were men in the prime of vigorous life, capable of and accustomed to use great muscular exertions, such as sailors, firemen, policemen, Grenadier guards, watermen, cricketers, gentlemen, Oxford and Cambridge rowers, and the like; a certain quantum of paupers and artizans may be fairly set off by an equivalent allowance of draymen, wrestlers, and pugilists, who are inserted."—(Dr. Chambers on Corpulence, or Causes of Fat in the Human Body).

Report in 1761 *of the Attorney and Solicitor-General on the Petition for a Charter for the Equitable Life Assurance Society:*

To the Right Hon. the Lords of a Committee of His Majesty's most Hon. Privy Council. May it please your Lordships,

In humble obedience to your Lordships' order of the 2nd April, 1760, referring to us the annexed copy of a petition of the Hon. Coote Molesworth, of Chichester, Doctor in Physic and Fellow of the Royal Society; Sir Richard Glynn, Knight Banneret and Alderman of London; Thomas Pickering, of London, D.D.; John Silvester, of London, M.D. and F.R.S., and 78 others, in behalf of themselves and many others his Majesty's dutiful and loyal subjects, for our consideration and to report our opinion thereon to your lordships, which petition sets forth:

That great numbers of H.M.'s subjects, whose subsistence principally depends on the salaries, stipends, and other incomes payable to them during their natural lives, or on the profits arising from their several trades, occupations, labour, and industry, are very desirous of entering into a society for assuring the lives of each other, in order to extend after their decease the benefit of their present incomes to their families and relations, who may otherwise be reduced to extreme poverty and distress by the premature death of their several husbands, fathers, and friends, which humane intention the petitioners humbly apprehend cannot be effectually carried into execution without H.M.'s royal authority to incorporate them for that purpose. That to effect their humane intention, the petitioners beg leave to propose the following plan, viz.:—

That the petitioners shall form themselves into a society for the Assurance of Lives, and that they and their successors shall have power to grant policies for that purpose.

That on granting such policies, the petitioners and their successors shall receive, and from time to time shall continue to receive, from the persons to whom the same are respectively granted, a premium or premiums proportionate to the chance of death attending the age of the life or lives assured, and the term of years for which the same shall be respectively assured.

That on granting such policies, the petitioners and their successors shall also receive from the persons to whom the same are respectively granted, a deposit of a further sum to answer the ends of a joint stock or fund, which deposit shall be placed out on government or other sufficient securities, and there remain to make good any deficiency or deficiencies that shall or may happen to be in the fund arising from premiums, by means of an unusual mortality amongst the members of the said society, or by any other means whatsoever.

That no such policy or policies of assurance shall be granted to any person or persons, until he or they shall have signed or executed a declaration or covenant purporting that he or they do voluntarily enter into and become a member or members of the said society, and will so continue during the term or terms for which the policy or policies to be granted to him or them shall respectively continue in force, and will bear or pay their proportion or proportions of any loss or losses which during such term or terms shall or may happen to the said society, and exceed the amount of the premiums and deposits to be paid as aforesaid.

That the petitioners are ready and desirous to ascertain and fix the several premiums and deposits proposed to be by them and their successors taken as aforesaid, and also to be restrained from acting contrary to their said plan.

That establishment by H.M.'s Royal Charter of a free and open office of Insurance upon the plan aforesaid will, as the petitioners with great submission apprehend, be more equitable than any hitherto proposed as being calculated for the sole benefit of the persons assured, a method not hitherto practised, and will, as the petitioners humbly hope, in a variety of instances prevent the before mentioned inconveniences, and be productive of the greatest advantages to the public.

That there is at present subsisting but one Corporation for the present assurance of lives, which, as the petitioners humbly apprehend, acts upon so circumscribed and narrow a plan, that very few of H.M.'s subjects do receive any benefit from it, in comparison with the great number to whom the benefit of such an Insurance might be extended.

The petitioners, therefore, humbly pray that his Majesty, out of his royal grace and favour, will be pleased to grant H.M.'s Royal Charter for the purposes aforesaid, unto the Right Hon. Hugh Lord Willoughby, of Parham; the Hon. Coote Molesworth, M.D.; Sir Thomas Heathcote, Bart.; Sir Richard Glynn, Knight Banneret; and Sir Thomas Ladbroke, Knight and Alderman of London; John Silvester, M.D., Edward Rowe Mores and Adam Martin, Esqrs., William Sclater and James Townley, Clerks, William Mountain, F.R.S., William Mosdell, William Bonham, Michael Tovey, Thomas Smith, Charles Lucas, Richard Emans, John Bedford, George Coulton, James Brooks, and — Gentlemen, by the name of the "Equitable Corporation on Lives," under such restriction as to H.M. in his royal wisdom shall seem meet.

Upon this petition your lordships will be pleased to observe:—

1st. The petitioners propose to insure upon cheap terms and for a longer time than is practised at present in any offices, to which end they have specified the rates at which the Assurance is to be done.

2nd. They propose to raise a capital by investing the premiums, together with a small additional sum of 40s. to be deposited by every person insured, to answer all losses; and by way of further security, to oblige every person insured to become a member of the Corporation, and to declare or covenant that he will bear his proportion upon any call if the premiums and deposits should be deficient.

Upon these proposals we are required to deliver our opinions whether it will be proper for H.M. to grant the petitioners a Charter of Incorporation for these purposes.

We, having been attended with counsel on behalf of the said petitioners, and also by counsel on behalf of the Governors and Companies of the London and Royal Exchange Assurance Companies, and also on behalf of the Corporation of the Amicable Society, for a perpetual Assurance on Lives in Serjeant's Inn, the said Companies and Corporations having entered caveats with the Attorney-General against granting the prayer of the said petition, and the said petitioners and their opponents having produced the several affidavits annexed to this our report, we have proceeded to examine the same, and after the best consideration we have been able to give the subject, we are humbly of opinion to advise H.M. not to comply with the prayer of the said petition, for the following reasons:

1st. Because it appears to us altogether uncertain whether this project will or can succeed in the manner in which it is proposed, and if the success is uncertain, the fund for supporting it which is to arise from the profits of the undertaking will be precarious.

This last objection is, in our opinion, a fatal objection to the scheme; for though an undertaking plainly calculated for the benefit of the public may in some instances deserve encouragement, even where the success is dubious, yet in such cases the projectors alone ought generally to abide the peril of the miscarriage.

In the present proposal, therefore, whatever else may be hazardous, the capital or fund to answer losses ought to be certain and liable to no casualty, for which reason, when the legislature enabled H.M. to erect the two Corporations of the Royal Exchange and the London Assurance, they thought it necessary to oblige these bodies in the first place to raise a large capital before they began to insure.

The success of this scheme must depend upon the truth of certain calculations taken upon tables of life and death, whereby the chance of mortality is attempted to be reduced to a certain standard; this is a mere speculation never yet tried in practice, and consequently subject, like all other experiments, to various chances in the execution.

The tables upon which the calculations are built are the bills of mortality of

London and the Breslau tables, and admitting them to be strictly accurate (of which there is strong reason to believe the contrary), they are compounded of diseased as well as healthy persons of those who are embarked in dangerous as well as other employments without pointing out the proportions they bear to each other, and yet as the petitions propose to ensure only such even of the healthy as are not employed in dangerous occupations, the register of life and death ought to be confined, if possible, for the sake of exactness, to such persons only as are the objects of insurance, whereas the calculations offered embrace the chances of life in general, the healthy as well as unhealthy parts thereof, which, together with the nature of such persons' occupations, are unknown numbers.

As the fund to answer losses must depend principally upon the premiums (for we pay but little regard to the small deposits or the personal covenant), the project should be sure of success otherwise the adventurers will be undone or greatly injured, and the project will fall the heavier because it will fall principally upon the poorest sort, the rich having no temptation to assure. Under these circumstances if there were no other objection against the scheme proposed, the uncertainty of success would make us fearful of advising the charter.

We are the more apt to doubt of the event, because it has been represented to us by the affidavit of Mr. Savage, that all the profit which has been received by the Royal Exchange Assurance Office, from the time of its commencement to the present time, amounts only to a sum of £2651 4s. 6d., the difference between £10,915 2s. 2d. paid in premiums and the sum of £8263 17s. 8d. disbursed in losses, which small profit must have been near exhausted in the charges of management. If, then, this Corporation, who are charged with taking unreasonable premiums, have reaped no greater profit, we can hardly expect a more considerable capital to arise from lower premiums, and the hazard of loss will be increased in proportion as the dealing will be more extensive.

2nd. The Crown has very wisely been always cautious of incorporating traders, because such bodies will either grow too great and by overwhelming individuals become monopolies, or else by failing will involve thousands in the ruin attendant upon a corporate bankruptcy.

As trade seldom requires the aid of such combinations, but thrives better when left open to the free speculations of private men, such measures are only expedient where the trade is impracticable upon any other than a joint stock, as was thought to be the case in the East India, South Sea, Hudson's Bay, Herring Fishery, and in some other Companies erected upon that principle; but there does not appear to be any such necessity in the present case, because the business of insuring lives is carried on, not only by the two great companies already mentioned, but such policies are duly underwritten by numbers of private men, and we think that if the profit were so enormous as the petitioners have endeavoured to represent upon the terms now and for many years practised in the City of London, there would not have been wanting enterprising persons to have reduced the premiums and drawn this branch of dealing to themselves by underselling the market. If the petitioners then are so sure of success, there is an easy method of making the experiment by entering into a voluntary partnership, of which there are several instances in this business of insuring; and if upon such a trial these calculations are found to stand the test of practical experiment, the petitioners will then apply with a much better grace for a charter than they can at present, whilst the scheme is built only upon speculative calculations.

3rd. The Parliament, in erecting the two great Companies already mentioned, have already declared their opinion that such charters ought not to be granted without some benefit accruing to the public, and were not sure when they passed the act whether they were not erecting a nuisance, to prevent which a power was reserved to the Crown to abolish the Corporation at any time within the term of 31 years, if they should be found upon trial to be mischievous or inconvenient; and we cannot help observing, that except only in the case of the Amicable Society of Serjeant's Inn, and which is formed upon a very narrow bottom, the Crown has never of itself, as far as it appeared to us, granted such a charter as the present in any case whatsoever: and as the two great Companies paid a very large sum to the public for the privileges of their charter, we cannot advise the Crown to entrench upon their rights on the bare request of any set of men without a clearer and more certain prospect of public good.

It is for these reasons principally, that we find ourselves under the necessity of advising his Majesty not to comply with the prayer of this petition; and though we are fully persuaded that those worthy gentlemen who have made this application are really convinced that this scheme will prove advantageous to the public as well as to themselves, yet we have not sufficient evidence to satisfy us that either of these ends will be answered or that any necessity of the times requires the trade to be extended under a new Charter of Incorporation.

All which is most humbly submitted to your Lordships' consideration by

Your Lordships' most obedient Servants,
C. PRATT,
C. YORKE.

Tuesday, July 14th, 1761.

CORRESPONDENCE.

LIFE - CONTINGENCY PROBLEMS.

To the Editor of the Assurance Magazine.

SIR,—As it is not uncommon to find inserted in Mathematical Journals occasional problems upon which such readers as are fond of analysis may exercise their skill, it has occurred to the writer that this characteristic may, also, in a mathematical sense, come within the scope of the *Assurance Magazine*. The three following Life-Contingency problems are accordingly offered in the hope that other actuaries may be induced to add to the list; for independently of the novelty which such problems in themselves may be expected to comprehend, they may also occasionally become the bases of various useful transformations of the ordinary formulæ, when treated by methods of solution varying with the ideas of different calculators. If it be further remembered that the precedent has already been offered by Simpson, in his "Select Exercises," so well known and appreciated by the profession, it may be reasonably presumed that actuarial readers, at least, will not think such forms foreign to the purpose of an *Assurance Magazine*:—

Annuities. The formulæ for adjusting the value of a Life Annuity, when it becomes payable by n instalments in the year, appears to have not hitherto been deduced in connection with the *column system*. It is required to effect this, and to thereby show the exact nature of the assumption upon which the usual approximation is really founded.

Assurances. It is required to be shown, that the value of a policy has always a certain relation to the *compound interest* of the sum assured, considered as a loan.

Probabilities. The limits of "probability" being zero and unity, it is required to be shown that any "definite integral," involving those limits, necessarily represents an *average* value; and that the recognised assumption by writers on probability, that the average result is also the most probable, is therefore virtually implied in the methods of definite integration, by which alone the results involved can be properly estimated.

E. J. F.

ON MEDICAL FEES PAID BY LIFE ASSURANCE COMPANIES.

To the Editor of the Assurance Magazine.

SIR,—The following information as to the working of the system of paying medical referees, may be interesting to some of your practical readers, who are still undergoing the harassments connected with that vexed question.

One thousand proposals having been made to an office within a certain time, the number of cases in which the Directors were enabled to decide without applying to the referee, (either because the life was obviously bad, or because he had been very recently assured under another Policy, or because he had no medical attendant)	was	276
The number of cases in which the Referee happened also to be the Company's Examiner, and in which no separate fee was paid	was	47
The number of cases in which the Referee was paid half a guinea, (the amount proposed to be assured being under £500)	was	328
The number of cases in which the Referee was paid a guinea	was	349
		1,000

And the total cost of the system amounted to 2·15 per cent. upon the first year's premium upon the new policies granted during the period.

I am, Sir,
Your faithful servant,
M. C. I. A.

ON THE PROPER MODE OF ESTIMATING THE VALUE OF PERMANENT AND TERMINABLE ANNUITIES.

To the Editor of the Assurance Magazine.

Sir,—In valuing permanent or terminable annuities, much must depend on the object and purpose of investment, and as to how far the realisation of the capital on the revenue desired from it, is of principal importance. Where immediate realisation is or may be required, the price that will be brought is of course the sole consideration; where, on the other hand, the revenue to be derived from the investment is the entire object, the price, paradoxical as it may seem, is little or no criterion of the value at which it should be estimated.

Thus, if the object in view be to secure in perpetuity an obligation for an annuity of £30, and this has been secured for £800, it will be of no consequence that the selling price of the fund rises to £1000; it is still put equal to the obligation, and if it be estimated at more, a corresponding value must be attached to the obligation. In short, whether the value of the fund rises or falls, it is of no moment to the obligant; there can be neither profit nor loss *quoad* the transaction. This is plain enough. It may be more strikingly illustrated as follows:—Suppose an investment has been made in the 3 per cent. Consols to secure an annuity of £100 in perpetuity, and that the investment had been made when the price of the Consols was £75, or for £2,500. If the funds should rise to par, and at the same time be reduced a quarter per cent., there would be an apparent gain of £833 6s. 8d., while in reality, there would be a loss of £333 6s. 8d.; at least, that sum would require to be further invested to maintain the annuity required.

The business of a Life Assurance Office partakes much less of that character where immediate realisation should be contemplated, than most companies, and rises very closely to the position we have just illustrated by figures, depending on the whole, for the general fulfilment of its contracts, most materially, if not principally, upon the revenue to be derived from its capital. While this is the case with reference to the whole general capital, the remark applies with more force to that portion consisting of permanent investment which we have at present in view, except for the sake of making a profit in such investments, which is not to be presumed to be the intention with which they are made; it can very rarely be expected that any necessity will arise for disturbing them prior to a time removed at such a distance as to make the present value of the capital then to be realised, very small, compared with that of the revenue to be derived in the meantime.

Calculating at 4 per cent. on an investment made at that rate, and to continue for 40 years, the value of the capital to be received at the end of that period, is only one quarter of the value of the revenue for that intervening period—and if for 28 years the value of the revenue is double that of the capital. It will thus be obvious of how little consequence the present selling value of such an investment is, and how little also any not very material change in its selling price at the periods contemplated for its realisation, will affect the present value.

It is believed to be the custom for many Assurance Offices, at an investigation, to value permanent and terminable annuities at the price they will bring on the average price for a short time previous; but the propriety of this is much to be doubted, indeed, it rather tends in the opposite direction to the truth. Composed, as a considerable portion of the funds of an assurance office is likely to be, of mortgages producing a variable rate of interest, when the interest on them is reduced the selling prices of permanent and terminable annuities are of course likely to rise, and if estimated accordingly, the effect is to show a profit on those funds, while in fact, the office, looking to the general return on its whole investments, would be essentially poorer; indeed, when the mortgages were producing a high rate of interest, there would be more propriety in estimating the permanent investments at the high value, although, of course, the selling price was then likely to be low.

Upon the whole, it seems clear, that the selling price is no proper criterion of the value at which investments of that nature should be estimated, where there is no intention of early realisation. Let the security for the annual returns be narrowly enquired into; if that be undoubted, then the proper way seems to be to estimate its value, if not altogether according to the rate of interest assumed by the office, more with reference to this criterion, than by a method which tends to increase the value at that rate, at a time when the average return on the whole capital is falling, and that general capital is hence less valuable in respect of its return, and which leads to a diminution in the value when it is well fortified by the general capital, yielding an enhanced revenue.

Glasgow, 20th Dec., 1850. I am, &c.,

W. S.

ON THE FRENCH LIFE ASSURANCE COMPANIES.

To the Editor of the Assurance Magazine.

Sir,—In the first number of your Magazine I observed that a slight sketch was given of the "Life Assurance Companies in France."

Our Actuaries at home are so occupied in these days of intense competition among Assurance Companies, in endeavouring to promote the objects of their own offices, and necessarily in watching the progress of competing Companies, that they have but little leisure to enquire what their neighbours on the other side of the Channel are doing.

Public attention, however, having been now called to this subject by the article just mentioned, some further enquiry into the system of business pursued by the French Companies, may not, perhaps, be uninteresting either to the general reader or to the Actuary.

That Life Assurance in France has been adopted from the English, and is still in its infancy there, the principal French Companies agree in allowing, as the following extracts clearly show.

The prospectus of "L'Union" speaks in its introductory article on the subject of Life Assurance as follows:—

. . . . "Mais il est une de ses branches peu connue encore en France. . . . . . . Cette création, qui seule suffirait pour caractériser le génie d'une nation, remonte en Angleterre aux premières années du XVIII^e siècle." And again—"En France, les Assurances sur la vie sont bien loin d'avoir acquis un semblable développement."

"La Compagnie d'Assurances Générales sur la Vie," established about the year 1820, also states as follows:—

"Les Assurances sur la vie, qui existent depuis plus d'un Siècle en Angleterre, sont encore dans leur enfance parmi nous."

It appears from the prospectuses of the French companies that their business at present is principally confined to absolute Whole Life Assurances, and Assurances for terms of years, on single or on two or more lives, and to Survivorship Assurances.

They do not seem to have yet adopted our multifarious modes of granting Assurances. And, indeed, if sufficient business can be obtained on the more simple plan, it is highly desirable to avoid all complications of a science already sufficiently complex; and it is well known that the transactions of those London offices whose standing is the highest, have almost entirely been confined to those classes of Assurances just mentioned.

The conditions of the different French offices appear to be very similar to those of our own respectable offices.

The only novel feature, and one which does not seem to have been as yet held out as an inducement to the British public* (though, in point of fact, the same advantages would, on application, be granted by many London offices,) is that of reducing the sum assured in default of payment of the premium within a certain period after the same becomes due, according to a scale agreed upon before the Assurance is effected, provided only that the Policy has been in force a certain number of years.

The following are the words of "L'Union" on this subject:—

"La prime est payable d'avance au domicile de la Compagnie. Elle est due au jour fixé par la présente, elle doit être acquittée au plus tard dans les trente jours qui suivent."

"A défaut de payment dans ce dèlai, la somme assurée est, et demeure réduite dans la proportion determinée au Tableau ci joint, et l'assuré n'est plus tenu à aucun versement pour les années à venir, cependant et par exception au paragraphe précédent, si la Police a moins de trois ans de durée, l'assurance est annulée en totalité.

TABLEAU.

Somme a laquelle se reduit une Assurance de 100 francs à défaut de payement de la Prime après un certain nombre d'années révolues.

Age à la Date de la Police.	Après 5 Ans.	Après 10 Ans.	Après 15 Ans.	Après 20 Ans.	Après 25 Ans.	Après 30 Ans.
30	12·16	24·05	35·60	46·49	56·38	65·08
40	15·21	29·54	42·57	54·02	63·78	71 91
50	18·49	34·74	48·61	60·13	69·35	75·97
60	21·25	38·91	53·04	63·18	—	—

At first sight this plan has an *ad captandum* appearance; but, upon consideration, many objections will appear: among which not the least would be the difficulty of securing against the life assured, (after the policy has been reduced in value, and the assured relieved from all future premiums), without the knowledge of the Company, leaving Europe for an unhealthy district, and returning with his health and constitution shattered, to die in his native land.

The same objection, it is true, is open to all single premium assurances; but, on the other hand, these are for the most part effected by persons of standing in independent circumstances, and who can be more relied upon than those who, from want of means, may be compelled to abandon their original policies.

The Table given below, shows the premiums for assurances for one year, and for the whole of life, required by five of the principal French Companies in juxta-position with five of the most respectable English Companies; by which it appears, that their rates compare very favourably with the English Companies of known standing.

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* Since writing the above, I have seen the prospectus of the United Service and General Life Assurance Association, and find therein a notification of a similar scheme.—*H.W.P.*

The five Companies chosen for this comparison, have been taken indiscriminately, and from their rates being all identical, it is reasonable to suppose that they represent the average premiums charged by the French Companies.

Table, showing the Annual Premiums required by certain French and English Companies, for the Assurance of £100 on a single Life:—

Ages.	French Companies.		English Companies.					
			Royal Exchange.		London Assurance.		Alliance.	
	One Year.	Whole of Life.	One Year.	Whole of Life.	One Year.	Whole of Life.	One Year.	Whole of Life.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. .	£ s. d.	£ s. d.	£ s. d.
30	1 11 0	2 9 10	1 13 3	2 13 3	1 8 9	2 11 11	1 6 9	2 9 2
40	1 17 10	3 5 8	2 0 9	3 8 0	1 11 7	3 7 0	1 12 7	3 6 6
50	2 12 0	4 13 3	2 15 0	4 10 9	1 19 6	4 16 1	2 10 9	4 14 2
60	4 6 0	7 2 8	3 18 0	6 7 3	3 10 2	7 3 8	4 3 7	7 14 11

The French Companies alluded to above, are, La Compagnie d'Assurances Generales (Established 1818); L'Union, (1829); La Nationale, (1830); La France, (1843); Le Phénix, (1846); each of which charges the same premiums as the others, both for one year and the whole of life.

It will be seen that the rates in question both for one year, and for the whole of life agree very nearly with those charged by the Alliance Assurance Company of London, whose rates, founded as they are upon the Carlisle mortality*, which is supposed to give a correct view of human life, may be considered to be as nearly equitable as possible.

From these circumstances, and from the fact that our neighbours do not appear to be attempting any dangerous experiments in Life Assurance, there is every reason to consider that their Offices, if well conducted, and prudently managed, are, to say the least, very superior to many of the new English Companies, with the announcement of whose novel plans the advertising columns of our newspapers are daily burthened. I remain, &c.

Alliance Assurance Company, *H. W. PORTER.*
Nov. 2nd, 1850.

ON THE COMPARATIVE ADVANTAGES OF THE OLD AND THE NEW METHODS OF COMPUTATION.

To the Editor of the Assurance Magazine.

Sir,—I shall be glad if you can make room for the following remarks. The distinction between the old and the new methods of computation in Life Contingencies, consists in the different nature of the data which they respectively supply for the solution of practical questions. The principle on which all such questions are solved, is to found an equation between the present values of the benefits to be purchased and the payments to be given for it, using a symbol for the unknown amount of the one or the other, as the case may be. The solution of this equation, which is always of the simplest kind, then gives the value of the symbol employed for the unknown amount. Or if symbols be used for both amounts, the equation will then be of a more general kind, and will give either amount when the other is known. Thus, if a benefit of a certain kind, amount m, is to be purchased by a premium, amount p, payable in a stipulated manner; then, if B denote the present value of a benefit of the same kind, amount £1, the present value of the benefit to be purchased will be denoted by mB. Also, if the present value of a payment, amount £1, to be made in the manner stipulated, be P, the present value of the payment p, will be p P., thence, equating these present values,

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* The rates of premium given in the Table as those of the Royal Exchange, are the Northampton rates, still used by the Equitable Society, and many of the older Companies. These rates of the Alliance appear to be deduced from the Carlisle Tables at 4 per cent., with 40 per cent. added. The premiums charged by the French Companies approximate still more nearly for the whole continuance of life, to those obtained from Farr's English Life Table, (census 1841), at 3 per cent., with 20 per cent. added to the pure premium, as may be noticed in the following comparison of the latter. Age 30, £2 9s. 4d.; Age 40, £3 5s. 6d.; Age 50, £4 13s. 0d.; and Age 60, £7 7s. 1d.—(Ed. *A. M*)

$$pP = mB;$$

whence we get,

$$p = \frac{mB}{P}, \text{ or } m = \frac{pP}{B},$$

according as m or p is given, and p or m required.

It is now assumed that B and P are known; unless they are so, we get no numerical result. And these are *present* values, that is, values *having reference to a single, and specified epoch*, and of a known amount, namely £1. It thus appears, therefore, that the data we require for practical purposes must be such as to afford us the means of forming with facility the present values of all conceivable benefits and payments. To tabulate the whole, with reference to each age, is obviously and altogether an impracticable task. It is, as I have stated, in the means they respectively afford for this formation, that the distinction between the two methods of computation consists.

The epoch to which, in the solution of a specified problem, the values made use of have to be referred, is the present age of the life or lives involved in the problem, and, as just intimated, the *amounts* must be the same. This is apparent, from the example just given. Now the data in the old method are one or more series of values,* of *the same* amount, (£1), but having reference, considered as present values, not to our epoch, bnt to as many epochs as there are values in each series. In using these data, consequently, when any other than the *present* age, is in question, a *reduction to the epoch* becomes necessary, for every additional age. These cases arise when either a benefit is to be enjoyed or a payment to be continued during only a portion of existence.

On the other hand, the data presented to us by the new method consist of two or more series of values, all of which, choose which epoch we may, *are present values with respect to that epoch;* and, with respect to each individual epoch, *are also of the same amount.* Thus, take any age, x ; opposite this age in column D, we find a number, D_x; now take any other age $x + n$; opposite this age in D, we find D_{x+n}, which is the *present* value of an endowment on (x), of D_x pounds, payable in n years; in N we find N_{x+n}, the *present* value of an annuity on (x) of D_x pounds, to be entered upon in n years; and so on. The value, in short, consists of nothing but *present* values, having reference as such *to each and every age in the table.* In the use of the new method, therefore, the necessity for what I have called *reduction to the epoch*, is entirely superseded. But this is not all; the amounts of the benefits with respect to such individual age, are also the same. With reference to age x as we have just seen, the uniform amount of the endowments whose present values occupy column D, is D_x pounds; and that of the annuities, whose present values occupy column N, is also D_x pounds. And so of the remaining columns. Now, in practical questions, it is of no moment what the *amounts* of the benefits and payments that enter the solution are, provided only these amounts are the same. This appears, from the foregoing type of solution. Thus, the values of p and m being respectively,

$$m. \frac{B}{P}, \text{ and } p. \frac{P}{B},$$

they are obviously not affected by any variation of B and P in the same ratio. Hence, except in the single case in which a present value is wanted as a final result (when division by D_x is necessary,) the data of the new method admit of being employed without any previons preparation.

The *reduction to the epoch*, of such frequent occurrence in the use of the old method, consists in a multiplication by $v^n . p_{x.n}$ for every value of n that occurs in the problem; or, which is the same thing, for every age, other than the present age, at which either a benefit or a payment is to commence; or, other than the end of life at which either a benefit or a payment is to terminate. This operation must, almost of necessity, be performed by means of logarithms; and as four or five tabular entries are required, it is obvious that it is attended with no small amount of trouble and liability to error.

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* Usually only one,—the annuities; but I found nothing on this at present.

I now give a few examples of corresponding formulæ by the two methods, premising that a_x denotes the present value of an annuity of £1 on (x), and that $p_{x.n}$ written in full is $\frac{l_{x+n}}{l_x}$.

Annual premium, payable $n+1$ times, for annuity of m pounds on (x), deferred n years.

$$\frac{mv^n p_{x.n}\, a_{x+n}}{1+a_x-v^n p_{x.n}\, a_{x+n}}\,; \qquad \frac{m\text{N}_{x+n}}{\text{N}_{x-1}-\text{N}_{x+n}}\,.$$

Annual premium, payable t times, for assurance of m pounds for n years on (x).

$$\frac{m\left[v\left(1-v^n p_{x.n}\right)-(1-v)\left(a_x-v^n p_{x.n} a_{x+n}\right)\right]}{1+a_x-v^t p_{x.t}\left(1+a_{x+t}\right)}\,; \qquad \frac{m\left(\text{M}_x-\text{M}_{x+n}\right)}{\text{N}_{x-1}-\text{N}_{x+t-1}}$$

Annual premium, payable t times, for assurance of m pounds on (x), payable in n years, or at death, if before.

$$\frac{m\left[v\left(1-v^n p_{x.n}\right)-(1-v)a_x-v^n p_{x.n}\left\{1-(1-v)a_{x+n}\right\}\right]}{1+a_x-v^t p_{x.t}\left(1+a_{x+t}\right)}\,; \qquad \frac{m\left[\text{D}_{x+n}+\text{M}_x-\text{M}_{x+n}\right]}{\text{N}_{x-1}-\text{N}_{x+t-1}}\,.$$

The disadvantage of the old method here clearly appears, in the large number of quantities that have to be dealt with, and, in particular, in the constantly recurring multiplications by the discounted probabilities. It will be rendered yet more apparent if any of the corresponding formulæ be worked out at length. I subjoin an example so worked out. It is one which really occurred, and the consideration of which led to the preparation of the foregoing remarks.

PROBLEM.

A party now aged (x) is assured for m pounds, at an annual premium, P, payable till death. He desires to change his assurance into another of the same amount payable in n years, or at death, if before. Required, the new premium P′, payable till the risk is determined.

This problem admits of treatment in various ways, all, of course, giving the same result. I adopt the method which seems on the whole the best, as less likely than the others to lead astray.

Benefit Terms.

(x) receives, first, an assurance of m pounds, payable at $x+n$ or at death, the present value of which, multiplied by D_x, is - - - - - - -	$m\left(\text{D}_{x+n}+\text{M}_x-\text{M}_{x+n}\right)$;
And, secondly, remission of the premium P, the present value of which, multiplied by D_x, is - - -	PN_{x-1}.

Payment Terms.

(x) gives up his present assurance, the present value of which, multiplied by D_x, is - - - -	$m\text{M}_x$;
And he pays a premium P′ for n years, the present value of which, multiplied by D_x, is - - -	$\text{P}'\left(\text{N}_{x-1}-\text{N}_{x+n-1}\right)$.

Hence, equating the sum of the benefit terms to that of the payment terms,

$$P'\left(N_{x-1}-N_{x+n-1}\right)+mM_x=m\left(D_{x+n}+M_x-M_{x+n}\right)+PN_{x-1};$$

Whence,

$$P'=\frac{m\left(D_{x+n}-M_{x+n}\right)+PN_{x-1}}{N_{x-1}-N_{x+n-1}}.$$

Let $x=40$; $n=20$; $\therefore x+n=60$; also, $m=£1000$; $P=£20$ 10s. 6d. $=20\cdot525$; and the rates of mortality and interest, Carlisle, 3 per cent. The formula then becomes,

$$P'=\frac{1000\,(D_{60}-M_{60})+20\cdot525\,N_{39}}{N_{39}-N_{59}}$$

and the working is as follows:

$$\begin{array}{lrrr}
N_{39}= \;\ldots\ldots\ldots & 28225\cdot536 & & \\
 & 52502 & & \\
\hline
 & 56451072 & & \\
 & 1411277 & & \\
 & 56451 & & \\
 & 14113 & & \\
\hline
 & 579329\cdot13 & & \\
1000D_{60}=618337\cdot6 & & & \\
\;\;\text{,,}\;\;\; M_{60}=411379\cdot7 & 206957\cdot9 & & \\
\hline
 & 786287\cdot0 & \text{log.} & 5\cdot8955811 \\
N_{39}=28225\cdot536 & & & \\
N_{59}=\;\;7105\cdot556 & 21119\cdot98 & \text{,,} & 4\cdot3246935 \\
\hline
P'= \;\ldots\ldots\ldots & 37\cdot22958 & \text{,,} & 1\cdot5708876
\end{array}$$

The formula by the old method is,

$$P'=\frac{mv^n p_{x\,.\,n}\left(1-A_{x+n}\right)+P\left(1+a_x\right)}{1+a_x-v^n p_{x\,.\,n}\left(1+a_{x+n}\right)};$$

or, for the particular case before us,

$$P'=\frac{1000v^{20}p_{40\,.\,20}\left(1-A_{60}\right)+20\cdot525\,\left(1+a_{10}\right)}{1+a_{40}-v^{20}p_{40\,.\,20}\left(1+a_{60}\right)}$$

and the working is as follows:

$$\begin{array}{llr}
v^{20}\ldots\ldots\ldots\text{(Jones, p. 103)}\ldots\ldots & \text{log.} & \overline{1}\cdot7432555 \\
l_{60}\ldots\ldots\ldots(\;\text{,,}\;\;\text{p. 290})\ldots\ldots & \text{,,} & 3\cdot5614592 \\
l_{40}\ldots\ldots\ldots(\;\text{,,}\;\;\;\text{,,}\;\;)\ldots\ldots & \text{colog.} & \overline{4}\cdot2945640 \\
\hline
v^{20}\,.\,p_{40\,.\,20}\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots & \text{log.} & \overline{1}.5992787 \\
A_{60}=\cdot6652994\;\;\text{(Jones, p. 540)} & & \\
1-A_{60}=\cdot3347006\;\ldots\ldots\ldots\ldots\ldots\ldots & \text{,,} & \overline{1}\cdot5246565 \\
\qquad\qquad 1000\;\;\ldots\ldots\ldots\ldots\ldots\ldots & \text{,,} & 3\cdot \\
\hline
1000v^{20}\,.\,p_{40\,.\,20}\,(1-A_{60})=\ldots133\cdot0256 & \text{,,} & 2\cdot1239352
\end{array}$$

$1+A_{40}=$	18·14242			
	52502			
	3628484			
	90712			
	3628			
	907			
	372·3731	. . . . . . 372.3731		
Numerator =		505·3987	log.	2·7036341
$v^{20}.p_{40.20}$ as above.		. . . . . .	log.	$\bar{1}$·5992787
$1+a_{60}=$ 11·49139 . . . (Jones, p. 312)			,,	1·0603725
		4·56721	,,	0·6596512
$1+a_{40}=$ (Jones, p. 311)		18·14242		
Denominator =		13·57521	log.	1·1327465
			colog.	$\bar{2}$·8672535
Numerator, as above		. . . .	log.	2·7036341
P′ =		37·22958	,,	1·5708876

Both methods, of course, give for the required premium the same value, £37 4s. 7d.; but the second is attended with at least four times the amount of labour* required by the first.

Another most important advantage possessed by the new method, is the facility it affords for the extension of the data. Columns of *present* values, unlimited in number, can be found by mere addition, while, by the old method, the formation of every additional column is attended with as much labour as the formation of the first.

P. GRAY.

Baker Street, Lloyd Square,
Nov. 23, 1850.

ON THE VALUE OF ANNUITIES CERTAIN, OF WHICH THE SUCCESSIVE PAYMENTS ARE THE FIGURATE NUMBERS.

To the Editors of the Assurance Magazine.

Gentlemen,—The following remarks will probably be found useful to many of your readers, and I therefore place them at your disposal.

I call 1, 1, 1; 1, 2, 3; 1, 3, 6, &c., figurate numbers, of 1th, 2th, 3th orders; and denote the respective annuities by Σv^n $\Sigma^2 v^n$ $\Sigma^3 v^n$ . . $\Sigma^p v^n$.

The first few cases are deduced from each other by finite integration, from which cases the general form is found by induction.

$$\sum v^n = \frac{1}{i} - \frac{v^n}{i} \quad \sum^2 v^n = \frac{n}{i} - \frac{1}{i}\left(\frac{1}{i} - \frac{v^n}{i}\right) = \frac{n}{i} - \frac{1}{i^2} + \frac{v^2}{i^2}$$

$$\sum^3 v^n = \frac{n(n+1)}{1\,.\,2\,.\,i} - \frac{n}{i^2} + \frac{1}{i^2}\left(\frac{1}{i} - \frac{v^2}{i}\right) = \frac{n(n+1)}{1\,.\,2\,.\,i} - \frac{n}{i^2} + \frac{1}{i^3} - \frac{v^3}{i^3}$$

and generally,

$$\sum^p v^n = \frac{n\,(n+1)\,.\,.\,.\,.\,(n+p-2)}{1\,.\,2\,.\,.\,(p-1)\ \ i} - \frac{n\,(n+1)\ (n+p-3)}{1\,.\,2\,.\,(p-2)\ \ i^2} + \,.\,.\,.\,.\, \pm \frac{n}{i^{p-1}} \mp \frac{1}{i^p} \pm \frac{v^n}{i^p}$$

in which the first term is invariably plus, then — + — + &c.

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* This would be considerably increased if the value of A_{60} were not assumed.

Multiplying both sides by i^p and altering the arrangement of the terms,

$$i^p \times \sum\nolimits^p v^n = \pm v^n \pm 1 \pm ni \pm \frac{n\,(n+1)}{1\,.\,2}\,i^2 \mp \,..\, + \frac{n\,(n+1)\,(n+p-2)}{1\,.\,2\,.\,3\,.\,(p-1)}\,i^{p-1}$$

the second side commencing with its second term is evidently the first p terms in the development of $\mp\,(1+i)^{-n}$ if this be denoted by $\mp\,\left[(1+i)^{-n}\,p\right]$

$$\sum\nolimits^p v^n = \frac{1}{i^p}\left(\pm\, v^n \mp \left[(1+i)^{-n}p\right]\right)$$

The number of terms and consequently the labour of computing $\Sigma^p v^n$ increases with p, but another form may be obtained for it, which has the singularity of being more readily computed when p is a large number, than when it is a small one.

$$\mp\left[(1+i)^{-n}p\right] = \mp\,(1+i)^{-n} - \left(-\frac{n(n+1)\quad(n+p-1)}{1\,.\,2\,.\qquad p}\,i^p + - + \&c.\right)$$

$$\therefore \sum\nolimits^p v^n = \frac{1}{i^p}\left(\pm\, v^n \mp v^n + \frac{n\,(n+1)\quad(n+p-1)}{1\,.\,2\,.\,p}\,i^p - + - \&c.\right)$$

$$\text{or } \sum\nolimits^p v^n = \frac{n\,(n+1)\,..\,(n+p-1)}{1\,.\,2\,.\,3\,.\,p}\left(1 - \left(\frac{n+p}{p+1}\right)i + \frac{(n+p)\,(n+p+1)}{(p+1)\,(p+2)}\,i^2 - \&c.\right)$$

an infinite series, but in all ordinary cases sufficiently convergent to give the value of $\Sigma^p v^n$ when p is not one of the first few numbers, much more readily than the previous formula.

It is often necessary to compute at the same time Σv^n, $\Sigma^2 v^n$, $\Sigma^3 v^n$, $\Sigma^p v^n$. When n is a given number, this may be done continuously by an adaptation of the primary formula.

Comparison of the values of Σv^n, $\Sigma^2 v^n$, $\Sigma^3 v^n$, given before, will show that

$$\sum\nolimits^2 v^n = \frac{1}{i}\left(n - \Sigma v^n\right)$$

$$\sum\nolimits^3 v^n = \frac{1}{i}\left(\frac{n\,(n+1)}{1\,.\,2} - \Sigma^2 v^n\right)$$

and that this will hold generally, which indicates the method to be followed.

If Σv^n, $\Sigma^2 v^n$, $\Sigma^p v^n$, are computed in this continuous manner, they may be all verified by computation of $\Sigma^p v^n$ directly from either of the formulæ given for that purpose.

Yours, &c.

November, 1850. W. ORCHARD, F.I.A.

To the Editors of the Assurance Magazine.

GENTLEMEN,—At the last meeting of the Institute, an interesting paper was read by Mr. Hardy, one of the vice-presidents. It had reference to a case that frequently arises in practice, and which is this :—I purchase an annuity certain, for, say n years, for which I pay its tabular value, at say five per cent. Now, reserving this five per cent. on the purchase money, out of the yearly rents as they are received, it is obvious that the balance must be immediately invested, *also at five per cent.*, in order to reproduce my capital at the end of the term. Unless it is so invested—if it is invested at a lower rate, say three per cent.—my capital will not be reproduced, and I shall not have realized five per cent. on my original investment. The question then arises, how ought the purchase money to be regulated, with reference to the annuity to be bought, and the rate at which the yearly balances can be invested, so that I may realize a specified interest on it during the entire term ? Or, if we call the purchase money m, the annual rent p, the rate that can be realized on the yearly balances r', and the rate we desire to make on the whole transaction and during the entire term r, it is required to determine the relation between m and p.

The yearly rent being p, and a year's interest on the purchase-money mr, reserving this we have $p - mr$, for the balance to be yearly invested at the rate r'. Hence, if we denote the amount of the annuity of £1 for n years, at this rate, by A, we have for the amount of the annuity $p - mr$, at the end of the term $(p - mr)$ A. But, by the condition, this is equal to m, the purchase-money. That is,

$$(p - mr)\,A = m\,;$$

$$\text{or,}\quad Ap - Amr = m.$$

Hence, if m, the sum to be invested, is known, and the yearly rent to be demanded is required, we have,

$$p = m\left(\frac{1}{A} + r\right);$$

or, if p, the annuity to be purchased, is given, and m, the purchase-money, is required, we have,

$$m = p\,\frac{1}{\dfrac{1}{A} + r}\,.$$

These are formulas of easy application, which is a fortunate thing, as there are so many variable elements (r, r' and n), that it would obviously be impracticable to meet every case by the use of previously constructed tables.

But, as it appears to me, a more practicable question remains behind. Although I realize only the rate r, on my original investment, my customer pays more than r on the advance to him. For while that is the rate he pays on the yearly decreasing portion of it in his hands, he also pays the difference between r and r', to the end of the term, on his yearly repayments, making on the whole an average rate* higher than r, since, by hypothesis, r' is less than r. It, therefore, clearly would not be safe to profess to be charging only the rate r for an advance, made in the circumstances supposed. A contract, specifying this as the rate, certainly could not be enforced. In practice, then, the arrangement will be made without reference to a rate of interest as between the parties, but each will make the best bargain for himself he can. Preliminaries being arranged, therefore, the sum to be advanced, and the annuity to be paid being fixed, it is a question of importance to the lender to be able readily to ascertain the rate he will have realized by the transaction. That is, he will want to know how much he can reserve from the yearly payments of the annuity as interest on his advance, so as to leave just sufficient to replace his capital at the end of the term. For this purpose, in the foregoing expressions, A being known (since n, the term, and r', the rate at which he can invest his yearly repayments, are known) we have to consider m and p, as given, and thence to determine r. Thus,

$$Ap - Amr = m\,;$$

$$\therefore\quad Amr = Ap - m,$$

$$\text{and}\quad r = \frac{Ap - m}{Am} = \frac{p}{m} - \frac{1}{A}$$

This formula, like the others, will be of sufficiently easy application.

I am, Sir, your obedient servant,

London, Nov. 30, 1850. A SUBSCRIBER.

[NOTE.—Our correspondent does not seem to have anticipated that Mr. Hardy's paper would appear in this *Magazine*. We insert his letter, notwithstanding, since it gives a clear and simple account of the matter. The problem has been investigated also by the late Mr. Morgan, as will be seen on reference to his work on "Assurances," page 321, in the Appendix. It does not, however, seem to have occurred to any of these writers, that by far the most simple way to treat the question would be, to construct tables, showing the annual payments required at practicable rates to produce £1, at the end of n years. Calling these results r', we should have the relation between p and m (to use our correspondent's notation) by inspection, and $m = \frac{p}{r + r'}$, $p = m\left(r + r'\right)$, and $r = \frac{p}{m} - r'$. Ed. *A. M.*]

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* This rate may be found from the tables, approximately at least. It is the rate which gives m as the present value of an annuity of p, or $\frac{m}{p}$ as the present value of an annuity of £1, for n years.

Reviews of New Works.

As it will be part of our duty to notice from time to time whatever publications issue from the press, bearing upon the subjects within the scope of the *Assurance Magazine*, we may properly commence this department of our labours by a slightly retrospective glance at some of the more prominent productions of the last year or two; particularly as several works on the subject in question, of more than ordinary utility and importance, have been ushered into the world within that period. The first we take up has for its title—

Notes on the Pecuniary Interests of Heirs of Entail, with calculations regarding such Interests in reference to the Acts of Parliament affecting Entails, and Tables showing the Values of Life Rent Interests. By William Thomas Thomson, One of the Vice-Presidents of the Institute of Actuaries, Manager of the Standard Life Assurance Company. Edinburgh: William Blackwoods and Sons. London: W. S. D. Pateman, Wine Office Court, Fleet Street.

It has often occurred to us, that if the knowledge of the lawyer and the actuary could be combined in one individual, that which appertained to each would be rendered much more complete and serviceable. For want of the information of the actuary the lawyer is often led into erroneous conclusions, and it may be that the reverse takes place not unfrequently. The work before us illustrates the truth of this position. The author, although by profession an actuary, has evidently been at the pains to make himself thoroughly acquainted with the very peculiar enactments relating to his subject, and has carefully studied the effect of them, and the consequence is that the calculations and Tables he has given are exactly adapted to almost all the cases likely to arise in practice. Our readers are, no doubt, aware that important charges have recently been made in the law of entail in Scotland, and it is to meet the exigencies which these changes have given rise to, that the work has been published. The extracts from the evidence, as to the prejudicial effects of entails generally are highly instructive, and might be read with great advantage by the advocates for their creation. After showing under what conditions heirs in possession may disentail—first, where the consent of no other heir is required; and, secondly, where the consent of one or more is necessary. Mr. Thomson proceeds to discuss the relative pecuniary interests of heirs in possession and reversion, and explains his method of determining the value of such interests; giving supposititious cases by way of illustration, and adverting to the various incumbrances with which landed estates are commonly saddled. Some nice questions, as to the conflicting rights of parties under particular circumstances, are entered into, the reasoning in reference to which is instructive, and the difficulties still felt for want of authentic information as to the average number of persons marrying at particular ages; the average age of women married to men of a particular age; the average number of children to each marriage, &c. &c., are rendered apparent. The volume concludes with a collection of all the requisite Tables and rules for their application. The subject matter is judiciously arranged and clearly treated throughout. So that the student and man of business, as well as those to whom it is more particularly addressed, cannot fail to consult its pages with great advantage.

We next lay our hands upon:—

Tables and Formulæ for the Computation of Life Contingencies, with Copious Examples of Annuity, Assurance, and Friendly Society Calculations. By Peter Gray, F.R.A.S., Associate of the Institute of Actuaries of Great Britain and Ireland. London: Longman, Brown, Green, and Longmans. W. S. D. Pateman, Wine Office Court, Fleet Street.

If this work were the production of one "to the manner born" and the business of whose daily life led to such investigations, the reader, however much he might appreciate its merits, would have no reason for surprise; but, when we state, as we believe we may correctly do, that it has been a labour of love, a thing quite apart from the author's ordinary occupation, we feel that it must be looked upon with considerable admiration were its intrinsic worth less than it really is. The work might have been, as it appears to us, more accurately described as a treatise on the art of constructing tables, particularly those required in determining the value of Life Contingencies, with Logarithmic Tables appended. For such it really is,—the ground moreover, is almost entirely new, no writer has hitherto touched upon it to any extent, so far as regards Life Tables, although many of the methods described were known, but the introduction of the use of Gauss's Tables, we believe, originates with Mr. Gray, as well as several very important and ingenious contrivances, which, to use the author's own words, afford greater facilities for the formation of tables than have hitherto been at the command of the computer. Throughout the range of applied mathematics, there are few instances in which Tables, like those of Gauss, are called into requisition more frequently than in the application now before us. It constantly happens, in calculations connected with Life Assurance, that, without need to take cognizance of the natural numbers, a series of Logarithmic values is required, which can only be obtained, with the common Table in each case, by a double reference. These Tables, however, enabling the computer to pass at once from Log. x, to Log. $(1+x)$, effect a saving of one conversion for each value, the vast importance of which, as regards labour and liability to error, will be readily understood. The first chapter is devoted to a description of these Tables and the manner of using them. Chapters 2 and 3 treat of compound interest, and the theory of probabilities,—the best mode of constructing the corresponding Tables being fully detailed in the former. Chapter 4 contains the germs of Mr. Gray's new methods, which we can only briefly allude to as consisting of a different arrangement of the factors employed in the formation of the usual series and the introduction of differences, which he uses with great effect:—Thus, to form column D; from the equation $\frac{D_x}{D_{x+1}} = \frac{l_x}{vl_{x+1}} = \frac{1}{vp_x}$, he derives the expression Log. $D_{x+1} =$ Log. $D_x +$ Log. vp_x. Log. p_x is one of what the author styles his "Elementary Values," and is first tabulated for each age and then "differenced;" Log. vp_x is afterwards readily obtained for each age, by addition of the differences of Log. p_x to Log. vp_x and these values being in their turn added to Log. D_x the construction of the column is completed. The advantages of this mode, where calculations are required on a limited scale, are to be prized, but on an extended one they will be found in many particulars of the greatest importance.

Chapters 5 and 6 are occupied with the application of these methods to the formation of every description of Table used in the calculations of Life Contingencies, including allowances in sickness; and in Chapter 7 we have the "Commutation Tables," as they are called, treated in the same fashion.

The 8th and last Chapter gives a history of the "Commutation Method," and sets forth the share which Mr. Barrett, Mr. Morgan, and Mr. Davies may be considered as having, respectively, in its invention and improvement. Every one at all conversant with the subject will probably agree with the author as to the superior claims of Mr. Barrett, but after the perusal of Mr. Hendrick's paper in our first number, it is impossible not to feel considerable doubt whether Mr. Barrett has dealt with perfect candour in the business.

Such then is a brief and imperfect outline of the work before us,—of the order and precision which characterise it throughout—neatness and simplicity of the demonstrations, and minute and laborious accuracy of its details,—we fail to give any adequate idea. The book, however, is nothing short of a standard one, and might, we would venture to suggest, be classed with great propriety amongst those selected as the text books in the future Examinations of the Institute.

Our space in the present number will allow us to notice only one other publication, viz.:—

A Few Thoughts on Commission, Divisions of Profit, Selection of Lives, the Mortality in India, and other subjects relating to Life Assurance. &c., &c. By Samuel Brown, Esq., F.I.A. London: W. S. D. Pateman, Wine Office-court, Fleet-street. 1849.

This is not a very ponderous volume: but amongst those of much greater dimensions there are, probably, few whose contents range over so wide a field. The author brings to his task great ability, thorough knowledge of his subjects, and very considerable experience in practical details. The information he has collected from such various sources is not only in itself extremely interesting, but is especially valuable as indicating the sources themselves, scattered, as many of them are, in reports and periodicals where few persons would expect to find them. This is particularly the case in the articles on the Mortality in India, in which the author appears, after searching in every direction, to have got together whatever materials are to be found in relation to the subject; so that any one investigating it may at once ascertain the *quantum* of data within his reach. The observations on the Division of Profits may be read with great advantage, but we can scarcely think that any Society or Company ever contemplated the mode of valuation which Mr. Brown is so severe upon. To use a true table of Mortality and Interest, to determine with them the value of the premiums actually charged, and to divide the surplus resulting from such a process, is clearly to leave nothing whatever but a mere provision for the sums assured. So wild a project could hardly, we think, have received encouragement in any respectable quarter. But, bad as it would be, the much vaunted practice of valuing by means of the Table from which the premiums charged are derived, is little better; so far from its "*dividing profits only as they are realized*," the result is frequently quite the reverse! But to return: "The Effect of the Selection of Lives" is ably treated, and here again the extent of the author's reading is very conspicuous—almost all that has been written on the subject being brought together to show the strong tendency of selection to diminish the rate of mortality in the years immediately following it. Mr. Farren, in his very able and masterly work published at the commencement of the present year, has shown its precise effect during the first year by means of the data derived from the "Experience of Offices," and Mr. Higham, in a paper read before the Institute, has, with great ingenuity, exhibited, by means of that and other data, the value of Annuities on Lives, all selected at one and the same age. Both these gentlemen's deductions are entirely confirmatory of our author's views. The letters on the Capital of Life Assurance Companies are full of instruction for Directors, Proprietors, and persons Assured. The antagonistic character of the interests of the two last-mentioned is exhibited in very strong relief, although we are inclined to think that the former gentlemen, we mean the Proprietors, were not in early days quite so dead a weight as Mr. Brown seems to consider them. They probably aided a good deal in the building up of the Societies which have attained such colossal proportions in our day; no doubt they have received their reward—and, it may be, something more. If the compensation be in proportion to the risk, the gentlemen who constitute the Proprietory in some offices of more recent formation are, perhaps, not quite adequately remunerated—large though their remuneration be. The last division contains an ingenious application of the theory of finite differences, by means of which, and in a mode analagous to that of interpolation, the author finds the values of Annuities on Joint Lives at a given rate of interest from values which have been calculated at other and different rates. An index, of remarkable copiousness, is appended to the book, which addresses itself to a wider circle of readers than any which we remember to have seen on the same subject.

REPORTS OF ASSURANCE COMPANIES.

In continuing the Reports of Assurance Companies for an entire year, begun, in alphabetical order, in our last number, we begin by the insertion of one omitted in the last, and complete the Reports from letter G to letter N, inclusive. It should be observed that, for the sake of system and uniformity, we give only such as were published before the end of August, but the arrangement may be afterwards completed for the whole of 1849 and 1850.

British Empire Mutual Fire Assurance Society.—Annual Meeting, held August 29th, 1850.—The second year of the Society's existence terminated on the 30th June, 1850. Since its formation, £2,494 8s. 11d. had been received as gross premiums, covering 2,830 policies issued for £1,163,511. The losses during the same period have amounted in the gross to £962 1s. 5d., of which, however, £111 7s. 9d. have been re-assurances, leaving £850 13s. 8d., being a proportion of 34 per cent. of the premiums. The losses of the Society would have been still further reduced had the assurance of thatched buildings been earlier discontinued. In some instances, as at Great Ashwell and Cottenham, whole villages, roofed mainly with thatch, have been more than half destroyed.

Law Life Assurance Society.—Annual General Meeting, Feb. 1850.—From the Report, it appeared that the state of the funds was as follows:—

Summary, showing the general assets of the Society on the 30th Dec. 1849:—

The Consolidated Guarantee and Assurance Fund.

			£	s.	d.
Balance of Assurance Fund on the 31st Dec. 1848			2,807,909	7	3
Balance of Guarantee Fund on do.			457,229	6	6
			3,265,138	13	9
Received during the year, 1849,—					
New Premiums		23,395 6 10			
Renewal Premiums		294,153 6 3			
Profit and Loss		83,653 16 2			
			401,292	9	3
			3,666,341	3	0
Paid during the year 1849,—					
Claims on Death............	185,612 4 6				
Bonuses	58,207 0 0				
,, ...	11,930 17 10				
Charges for Management, including Law charges	6,235 9 7				
Repairs, Alteration, and Printing	1,628 15 10				
			263,614	7	9
			£3,402,726	15	3
The Total General Balance, being the amount of the Assets of the Society, on the 31st Dec., 1849, of which the Guarantee Fund amounts to			457,229	6	6
Assurance Fund amounts to			2,945,497	8	9
			£3,402,726	15	3

The Chairman stated that during the year there had been an increase in their number of policies, amounting to 22, whilst their premiums had increased upwards of £5,000.

The losses had amounted to £39,000 more than those of the year before; but amongst the deaths 13 were attributed to cholera, and the sum paid in respect of these was upwards of £16,000.

Since the year 1846, the Society had lost six Directors, and the Board was accordingly reduced to the original number of 24, and, should another vacancy occur, it would be necessary to fill it up.

With regard to the apprehension which had been expressed respecting their Irish Mortgages, the Chairman assured the Proprietors that their property was in no danger whatever; Mr. Martin's estates comprised 196,000 acres, and the sum of money advanced thereon amounted to £160,000. This money would be repaid to them if they received £1 per acre for the fee-simple of the Estates mortgaged. At the time they advanced the money on Lord Portarlington's estates, those estates were worth £40,000 a-year; but, in addition to the investments in Ireland, they held securities upon Lord Portarlington's property in England, which was of very considerable value. They must bear in mind that the interest upon property in Ireland was 6 per cent., whereas property in England yielded only 4 per cent.

Legal and Commercial Fire Insurance Company.—Annual Meeting, held 4th July, 1850.—The Report states, that the past year has been one of considerable trial in consequence of the formation of several new offices, and principally in consequence of the reduction, by the older establishment, of the extravagant rates charged on warehouses and other extensive premises.

During the past year 138 new agents have been appointed, and during the same time 2,413 new policies have been issued, averaging £858 each, and the income of the Society has increased from £7,265 1s. 8d. to £8,228 9s. 5d.

During the past three years the amount received for premiums has been	£18,482
„ the claims paid . .	8,482
Leaving a surplus of	10,000

After defraying all the preliminary expenses, the amount paid for interest to the shareholders, and the expenses of establishing agencies, there remains still a disposable balance of £1,034 3s. 7d. This balance would have been much greater but for the large expenses necessarily incurred in the formation of the office and in establishing about 510 efficient agencies in all parts of England, Wales, and Scotland.

The progress of the Society may be further manifested by a comparison derived from the Paliamentary Returns of the duties on Fire Insurances paid to Government by this office during the last three years.

In 1847 the duty was £2,043
1848 „ 4,846
1849 „ 6,460

Interest at the rate of 5 per cent. was declared on the paid up capital of the Society.

Balance sheet for the year ending 31st March, 1850.

Dr.	£	s.	d.	£	s.	d.
To Subscription Capital				202,660	0	0
Duties—						
„ Balance in hand at last statement	2,429	15	8			
„ Received in the past year	7,144	19	6			
				9,574	15	2
„ Premiums	7,692	2	1			
„ Interest on Investments	251	9	5			
„ Poundage on Duties	284	2	11			
„ Transfer Fees	0	15	0			
				8,228	9	5
Balance of Profit and Loss account—						
„ From last statement	1,592	11	11			
„ Deduct for interest in arrear since paid	4	14	0			
				1,587	17	11
				£222,051	2	6

Cr.	£	s.	d.	£	s.	d.
By Capital not called up				193,092	0	0
Society's offices and preliminary expenses—						
„ Balance from last statement	3,041	5	7			
„ Fireproof Safe since erected	36	16	6			
				3,078	2	1
„ Duties paid to Government				6,495	9	2
Management and Charges—						
„ House and Office expenses, Rent, Taxes, &c.	365	12	1			
„ Salaries	848	18	7			
„ Postages and Parcels	102	8	9			
„ Printing and Stationery	291	18	4			
„ Advertising, and Agents' Showboards, including Almanacks for 1849 and 1850	301	11	11			
„ Stamps	109	16	9			
„ Directors and Auditors	441	0	0			
				2,461	6	5
„ Interest to Proprietors				441	17	11
„ Agencies established 1849				481	9	1
„ Guarantees, &c.				550	12	0
„ Commission on Insurances paid to Agents				672	13	4
„ Claims for Fires				4,065	5	0
„ Balance, 3 per cents., £5,000	4,781	5	0			
„ On Deposit, £2,500	2,500	0	0			
„ Agents, in their hands	2,331	18	6			
„ Stamps in hand	31	0	0			
„ Balance of petty cash account	12	11	9			
„ „ at Bankers	1,055	12	3			
				10,712	7	6
				£222,051	2	6

Approved 27th June, 1850,
W. Lawrence, Chairman.
Fred. Jas. Hall, } Directors.
Robt. Ellis,

Statement of Profit and Loss.

To Premiums, &c., brought down				8,228	9	5
,, Balance of Profit and Loss as above	1,587	17	11			
,, Deduct Interest to Proprietors	441	17	11			
				1,146	0	0
,, Forfeited Deposits on Shares				53	0	0
				£9,427	9	5
By Preliminary Expenses, &c., written off for 1849				162	0	0
,, Management Charges				2,461	6	5
,, Commission				672	13	4
,, Agencies				481	9	1
,, Guarantees, &c.				550	12	0
,, Claims for Fires				4,065	5	0
,, Balance for Dividend and Reserve Fund				1,034	3	7
				£9,427	9	5

We, the undersigned Auditors, have examined the Accounts to the 31st March, 1850, and do certify them correct, as above stated,

Joseph Hadland,
Wm. W. Wilson.

Legal and Commercial Life Assurance Society.—Annual Meeting, held 15th May, 1850.—From the establishment of the Society to the 31st Dec. last, 727 policies had been issued; of these 560 remained in force, producing an annual income of £6,082 12s. 0d.; 167 policies had lapsed by death and otherwise, on which the premiums received by the Society amounted to £2,445. A further sum of £749 on two policies had been paid since the 31st December.

During the past year 235 new policies had been issued, on which the amount of annual premium was £2,756 7s. 2d. The average age of lives assured was 33 years, and the average amount of policies £388. During the past year nearly 200 new agents had been appointed and instructed in their duties in the principal towns and cities of England. The loans granted during the past year had not been to any great extent, £5,105 having been lent to 22 principals, with their sureties, on personal security; and £2,565 to 11 persons on freehold and leasehold security. The increase in the amount of business transacted last year over the previous year, had been in new premiums more than 84 per cent. During the 4 months of the current year, up to the 30th April, there had continued to be a progressive increase on the amount of last year; the number of policies in that period being 91, and the amount of new premiums £1,229 16s. 10d., an increase in the latter of 34 per cent. over last year, or of 150 per cent. over the previous year.

A dividend of 4 per cent. was declared to the shareholders, on the amount paid on their shares.

London and Liverpool Insurance Company.—Annual Meeting, held 20th Feb., 1850.—The Report states, that the Fire business exceeds by a million that of 1848, and that the premiums also are more than they were last year. The losses were heavier than usual.

In the Life department, the number of policies issued was 236; the amount insured, £132,883; the new premiums received, £4,262 1s. 2d.; whilst the claims, notwithstanding the terrible mortality with which this country was visited, were only 8 per cent. greater than in 1848. Until the beginning of 1846, but little interest was taken to increase the Life business; since that time, after paying claims to the amount of upwards of £50,000, there remains to the proprietors an available profit of £27,081 10s. 7d.

The balance of £62,123 3s. 8d., together with the Reserve Fund, which now amounts to £130,002 10s., are the appointed means of providing against the liabilities of the Company, and for the dividend of the year. The low rates of interest obtained during the past year, the results of the fire business, and the desire to set apart the sum of £40,000 to meet any loss that may be sustained by the sale of securities, induced the Directors to recommend to the Proprietors a less dividend than they have latterly been accustomed to. They therefore proposed a dividend of 7s. 6d. per share, less income tax, and 5 per cent. on the uncalled capital, in the case of those shares in which £2 10s. have not been received. When that has been paid, and the amount of £20,000, which with £20,000 taken from the profit of the Life business will make £40,000, has been transferred to the "Investment Fluctuation Fund," there will then remain at the credit of this account £18,024 18s. 4d. as a guarantee against current risks.

The Chairman explained, that with regard to the proposition to set apart £40,000 to meet possible losses on securities, and with regard to the reduction of the dividend from 10s. to 7s. 6d., that owing to the depreciation in Railway property there was a great deficiency in the value of the securities. It had been the wish of the shareholders that the securities should not be parted with, but the Directors perceiving the disturbed state of the public mind, from the exposures which had taken place in railway management, and that it would probably be some time before a revival would take place, had been induced to set aside a special fund to meet any eventual loss. On the deficient securities, however, there had been a return of 4 per cent. during the year, and these securities altogether had yielded even to 5 per cent., notwithstanding the diminished dividends. The total amount of depreciated securities was about £234,000, the loss on which, during the past year, had fluctuated between £50,000 and £100,000. The life risks had been valued by Mr. Griffith Davies, and the result was that they could fairly set apart £21,000 as a surplus fund.

The sum of £300 was voted to the Directors for the ensuing year.

London Indisputable Life Policy Company.—Second Annual Meeting 14th June, 1850.—Since the annual meeting, in June, 1849, there have been received 452 proposals for the assurance of £185,254 19s. Of these proposals, 404 have been accepted and completed, assuring £120,502 15s., and yielding, in annual premiums, £4,529 16s. 4d., making the total sum now under assurance by the Company, £193,573 16s., and the annual revenue £7,439 12s. 2d.

Since the establishment of the Company there have been only three deaths, the claims upon which amount to £1,700—less than one half the calculated expectancy.

From the Balance Sheet and statement of the assets and liabilities, it appears that after providing for the payment of the sums assured and outstanding debts, including the whole preliminary expenses attending the formation of the Company, there remained on 31st Dec. last a balance of profit of £14,178 10s.

London Mutual Life and Guarantee. — Extraordinary General Meeting, held May 29th, 1850.—The chairman stated that the directors had been careful to give ample security to the assured, by a capital partly paid up of £50,000. Every share was taken, and there were 82 proprietors. The present Board held its first meeting as a Board on the 17th May, 1849. On the 31st October they had prepared the trust deed, and they were completely registered. On the 6th November they obtained their first proposal. From the 11th November to the 29th May they had issued 400 policies (the proposals being 548). The amount assured was £70,739, and the annual revenue was £2,319 9s. 6d. They had three endowment policies, premiums not returnable, for sums amounting to £400, and 17, the premiums being returnable, for £1390; 12 Contingent policies, for £1200, and four Deferred Annuities, premiums not returnable, for £70; and eight Guarantees for honesty, combined with Life Assurance, for £2,400. They had had 55 proposals for loans, and had accepted 17 for sums amounting to £2500.

Manchester Fire Assurance Company.—Half-yearly General Meeting, held December, 1849.—After passing a new law, respecting the investments on mortgage, a dividend, amounting to 5½ per cent. for the half-year, was declared.

The meeting then proceeded to declare bonuses of 15 per cent. on cotton mills, and 10 per cent. on all other risks for the last year to all annual policy holders.

The sum of £600 was voted to the Directors for their service during the past year, £50 to the auditors, and the thanks of the court to Mr. Herbert Spring, the Secretary, with a silver tea and coffee service to Mrs. Spring, with a suitable inscription on the salver.

Merchants' and Tradesmen's Mutual Life Assurance Society.—Annual Meeting, held March, 1850.—During the year from January 31st, 1849 to January 31st, 1850, 293 policies have been opened for assurances to the amount of £78,620, the premiums on which are £2,486 4s. 3d. Since the 31st January, 21 proposals have passed the Board for £8,300, the premiums on which are £285 12s., and there are 12 proposals before the Board for Assurances, to the amount of £2,850, the premiums on which are £88 7s. 6d., making the amount of assurances £137,155; and the annual premiums £4,302 16s. 5d.; 34 proposals have been submitted to the directors for assurances to the amount of £11,375, which they have deemed it prudent to decline. No deaths have occurred within the period embraced in the Report. The Directors have since received notice of one death, where the party was assured for £150.

The sum of £500 was voted to the directors for their services for the current year.

Metropolitan Counties and General Life Assurance Society.—Second Annual Meeting, held 8th May, 1850.—At the close of the first year on the 30th April, 1849, the Society had issued 212 policies, assuring sums to the amount of £67,801, and producing an annual income of £2,236 3s. 11d. On the 30th April, 1850, the Society had issued 532 policies, assuring sums to the amount of £176,557, and producing an annual income of 5,808 12s. 5d.; the total amount assured having increased in a greater ratio than the number of policies. The directors have reassured, with other societies, all lives upon which policies exceeding £1500 have been effected for the excess above that sum. Not one of the assured had died since the formation of the Society. An allowance of £20 per annum was voted to the auditors.

Mutual Life Assurance Society.—General Meeting, 20th February, 1850.—The Report stated that the new premiums received during the year 1848 amounted to £2,475 13s. 1d.; and during the year 1849 to £3,227 2s. 2d. A considerable sum had been added to the Invested Capital, and the expenses of management were lower in amount than they were during the year 1848 by £206. The balance sheet, giving the present value of the liabilities, and of the assets and income of the Society, shows a surplus in its favour of £74,096 2s. 9d. On the 31st December, 1849, 1247 policies were in force, assuring in the aggregate £828,090, at premiums amounting to £28,223 9s. 4d. per annum. The accumulated capital of the Society, invested in Government and real securities, amounted to £146,217 2s. 9d. The income of the Society from dividends on its mortgages, bonds, and funded property, amounts to £5,933 7s. 8d. per annum, making the total income £34,156 17s.

National Loan Fund Life Assurance Society.—Annual General Meeting, held May 22nd, 1850.—The Report stated, that the accounts of the past year, the mortality in which is extremely light, exhibit an amount of but £9,536 in claims paid, instead of £21,875 expected. The claims paid by the Society since its origin, to the 1st December, 1849, amount to £101,139, the expectancy being £121,511, leaving a balance in its favour on the whole period of £20,372.

Profit and Loss Account, 1st December, 1849.

Dr.	£	s.	d.	£	s.	d.
To claims paid	9,536	12	4			
Claims extinguished by purchase	1,708	17	3			
Bonus in cash paid to policy-holders	729	8	5			
	11,974	18	0			
Annuities paid	3,713	13	2			
Interest paid to shareholders	2,031	17	7			
				17,720	8	9
Commission	4,048	0	4			
Medical fees	1,037	9	5			
				5,085	9	9
London charges	3,528	1	8			
Branch charges	3,750	5	8			
				7,278	7	4

	£	s.	d.	£	s.	d.
Travelling expenses	716	19	0			
Law expenses	343	6	3			
				1,060	5	3
Advertisements	1,910	19	2			
Printing	495	0	9			
Stationery	119	11	9			
Exchange	17	18	0			
				2,543	9	8
				£33,688	0	9
Balance profit and loss				79,175	2	2
				£112,863	2	11

Cr.

	£	s.	d.	£	s.	d.
By Assurance Fund (new premiums)	18,268	0	9			
Ditto (renewals)	39,145	0	8			
Extra premiums	146	14	1			
				57,559	15	6
Immediate Annuity Fund	876	3	6			
Deferred Annuity Fund	1,350	0	7			
Endowment Fund	9	18	6			
				2,236	2	7
Interest, &c.				3,298	2	6
Profit and Loss				49,769	2	4
				£112,863	2	11

Assets, 1st December, 1849.

Investments:—	£	s.	d.	£	s.	d.
Houses in London and Dublin for premiums, furniture at head offices, and branch furniture	2,380	16	11			
Loans and Mortgages	27,091	12	10			
Loans on Policies and small Loans	36,465	14	0			
Consols, Stocks, and Bonds	15,807	9	2			
Reversions	525	15	4			
Agents' Balances	15,760	1	6			
Policy Stamps	67	10	6			
Shares repurchased	4,763	17	6			
Conversion of Shares	3,040	17	1			
Expenses of establishing Society	6,595	8	5			
Cash	6,179	17	10			
				118,695	10	1

The extent of new business has been greater in the present than in any former year, the number of policies issued being 1033, and the new premiums £18,268 0s. 9d. As compared to 1846, the increase in policies over that year is 496; over 1847, 401; and over 1848, 502.

From the extent of the business in the British North American Colonies the directors have deemed it advisable to appoint a local board and general agent at Montreal. The directors have also been much engaged in the formation of an agency in France.

The result of the annual valuation of the business of the Society, after leaving a balance of assets equal to 66 per cent. of the surplus, which, with the reserve in the valuation, leaves £82,454 5s. 6d. for future profits to the policy holders, not included in the present division, enables the directors to divide amongst those entitled to the present distribution, a cash bonus of 15 per cent., and a reversionary bonus varying from 20 to 56 per cent. on the premiums, and to the proprietors a bonus of four per cent. for the past year, in addition to the regular interest of five per cent. already received by them, and which will be paid with the half-yearly dividend in July next.

National Mercantile Fire Insurance Society.—First Annual Meeting, held December, 1849.—The Report gives the progress of the Society from its commencement at Christmas, 1848, to November 30, 1849. The nominal Capital of the Society is £250,000, in 25,000 shares of £10 each, of which 11,001 shares have been issued, and a call of £2 per share has been made, yielding a paid capital of £22,002, and representing a liability of £110,010. The number of shareholders is 268, so that, upon an average, the extent of liability of each shareholder amounts to only £410.

During the past year 144 agents have been appointed in different parts of the country. The Society had received Insurances from other respectable Societies to the amount of £150,967; but the Directors charge premiums according to their estimate of risks, and without reference to tariffs, which are binding on other Societies. The results of the past year are 1,491 Policies, the total amount insured by which is £1,322,985, giving an average to each Policy of £890.

The total of Losses sustained by Fire amounts only to £430 18s. 1d.; the total Receipts, £3,218 5s. 1d.; the total Expenditure incurred (including expenses, £2,056), £2,485 16s. 10d.; showing an excess of receipts over expenditure, of £732 9s. 3d.

The Capital of the Society had been invested in Government Securities, and in consequence of the rise in the market value, the profits on the Investment amount to a sum more than sufficient to pay the Proprietors 5 per cent. on their paid up Capital.

National Mercantile Life Assurance Society.—Report of the Directors for the year ending 30 September, 1849.—The Proprietors are congratulated that the Society has had to pay only the small sum of £1,500 for claims by death caused by cholera. The total amount paid for claims by deaths from all causes, from the commencement of the Society, in 1837, up to the present period, does not amount to more than £32,600 11s. 1d., being less than the present income of the Society for one year.

The expenditure of the office for the past year, (exclusive of commission and Medical Fees, which vary according to the amount of business), amounts to £2,695.

The next valuation of the assets and liabilities, will, according to the Deed of Constitution, be made at the expiration of the year 1850. The Directors have pleasure in drawing the attention of the Proprietors to the amount of Assurances effected in the four years ending December, 1845, in comparison with the four subsequent years, ending December, 1849.

The Total Amount Assured during the four years ending
December, 1845, was £355,695 13
" " " 1849, was £653,985 13

showing an increase during the last, as compared with the preceding four years, of 84 per cent.

During the same period, the assets of the Society have increased upwards of 100 per cent.

National Provident Institution.—Fourteenth Annual Meeting, held 15 December, 1849.—The Report states that in the past year 1,736 Policies of Assurance have been issued, the annual premium on which amounts to £27,233 19s. 5d.; 225 additional proposals for Assurance have been offered to the Board, which it has been considered advisable to decline.

The annual income of the Institution now amounts to £151,976 4s. 7d.

For the year ending 20 November last, the balance of receipts over the disbursements is £77,214 11s. 10d., increasing the Capital Stock of the Institution at that date to the sum of £517,243 7s. 1d., which is invested in real and Government securities.

The rate of mortality has been augmented by the fearful visitation of the cholera. The sums due on Policies of deceased members for the past year amount to £46,975 3s. 6d., of which £26,919 15s. 6d. has been paid to their representatives, and the remainder is in course of payment.

The Directors have caused an investigation to be made by the Actuary as to the mortality actually experienced among the Members in classes IX. and X. from the commencement of the Society up to the close of the accounts in November, 1848—a period of 13 years. It appears from the calculations made that, having reference to the numbers of Members Assured in these two classes, if the deaths had occurred at the rate assumed in computing the Tables of Premiums, there would, during the 13 years, have been claims under 627 Policies whilst the actual claims have been only 297, being about 43½ per cent. of the estimated mortality.

The following Statement shows the progress of the Institution from its commencement:—

Years ending.	No. of Policies issued.	Amount of Capital.			Annual Income.		
20 Nov. 1836. . . .	616	10,736	3	0	8,021	12	2
„ 1837. . . .	435	31,592	10	5	14,600	0	0
„ 1838. . . .	459	46,855	0	10	19,934	19	4
„ 1839. . . .	490	64,959	10	10	25,457	4	2
„ 1840. . . .	494	90,545	13	9	31,091	10	10
„ 1841. . . .	357	114,993	2	4	36,367	1	4
„ 1842. . . .	364	139,806	1	7	39,360	9	7
„ 1843. . . .	703	167,079	11	2	44,219	17	0
„ 1844. . . .	722	202,162	1	0	55,037	9	2
„ 1845. . . .	911	241,460	13	3	70,819	14	5
„ 1846. . . .	1,005	299,675	2	4	88,940	8	2
„ 1847. . . .	1,284	367,172	16	0	111,113	13	6
„ 1848. . . .	1,423	440,028	15	8	126,232	7	6
„ 1849. . . .	1,736	517,243	7	1	151,976	4	7
	10,949						

The sum of £1,500 was voted to the Directors, after a slight opposition, 15 hands only being held up against it.

North of England Fire and Life Insurance Company.—Fifth Annual General Meeting, 4th April, 1850.—In the department of Fire Insurance, the new policies issued during the year, cover property to the amount of £1,370,000, augmenting the yearly receipts for premium from this source by £4,150. The sums paid for losses during the year amounted to £1,982 7s. 8d.

The business of the year had exceeded that of the year preceding, by nearly 25 per cent. In the Life and Annuity Departments, considerable progress had been mode both in respect of the number of policies issued, and the amount insured during the past year. The income of the year from premiums in this branch amounted to £13,371.

Two deaths had occurred causing claims of £550, and being the first life policies that had lapsed since the office was instituted, the rate of mortality exhibited was only about 25 per cent. of what might have been anticipated according to the Tables on which the premiums were computed.

In stating the accounts, the Directors had charged the Life Fund with a per centage, on account of expenses of management, but not taken into account any proportion of the profits from this branch, which would be ascertained in 1852.

The number of agencies exceeded 200.

Norwich Union Fire Insurance Society.—Annual Court of Proprietors, held January, 1850.—A return of the aggregate sum insured in the past year showed a total of £60,994,177. The President stated that the annual income of the Society for premiums on Insurances now amounted to £93,590 6s. 10d., being a greater sum than ever before was shown as received in a single year.

The sums paid for losses by fire in the past year were below the average, and the general result of the year's transactions left them with a profit of £22,746 13s. 7d., which, added to a former reserve of £14,016 19s. gave them a total of £36,753 13s. 2d., now disposable. The Society had within the last three years sustained a heavy loss in Derbyshire (£20,000), which would probably be met by the profits of the next few months, but if not, they had ample reserves in hand for such an event.

The Directors had come to a resolution of declaring a dividend of 10 per cent. on the paid up capital.

The next business for which the Proprietors had been convened, was the renewal of their partnership, which, by the deed of settlement would expire on the 6th August, 1851. The deed of settlement which bore date the 6th of August, 1821, provided for the subsistence of the Society for a period of 30 years, but enacted that it should be competent to the Proprietors to renew the partnership, if they thought so fit, and fixed the time for determining this question at the present General Meeting.

The President, in explaining the position of the Society, stated, that at the date of its deed of settlement in 1821, the aggregate business of the office a little exceeded £40,000,000; now it exceeded £60,000,000; the paid up capital of the office in 1821 had been £66,000; now if divided, there was in hand £162,000, being nearly 150 per cent. increase, and during the whole 28 years the interest paid annually to the shareholders, had averaged £8 2s. 9d., per cent. The insurers had received in periodical returns no less a sum than £217,862, and there was now in hand £40,000 applicable to the returns, commencing at Michaelmas next, and which would be 10 per cent. on the annual premiums for the four years ending at the 29th September, 1849.

It was unanimously resolved to continue the Society for a further term of 30 years, commencing from the 6th August, 1851, when the original term expired, and that the Society should be continued upon the same laws, regulations, and conditions as are expressed in the Society's Deed of Settlement.

Norwich Hail Storm Insurance Company.—Annual Meeting of the Shareholders, held Jan., 1850.—The Society has been in existence seven years, and the statement of the accounts was so satisfactory that bonuses were declared of 75 per cent., where parties had been insured five years, and of 60 per cent. for four years, 45 per cent. for three years, and 30 per cent. if only insured for two years; a dividend of 5 per cent. was allotted, with a bonus of 10s. a share, to the shareholder, to be added to his paid up capital.

The Society has never had a single case litigated. The whole of the capital, £150,000, is subscribed; and a Reserved Fund exists of £1,500.

The Directors trust that the statements will satisfactorily show that their calculations of the risk have been as close to the actual amount as prudence and a just precaution would admit; and that had a lesser premium been adopted, or had not the last two or three seasons been more than usually favourable, there would have been no surplus to divide on this occasion.

The funds of the Society are wholly invested in Bank Stock, leaving only sufficient in the hands of the bankers to meet the yearly dividend of 5 per cent. to the shareholders, and the current expenses.

Norwich Union Life.—Annual General Meeting, held Friday, 5th July, 1850.—The Accounts for the year ending 30th June, 1849, were laid before the Meeting. The income for the financial year amounted to the sum of £257,482 2s. 11d., of which £169,671 14s. 4d. had been received on account of Annual Premiums upon policies. The assets of the Society amounted to

General Capital of the Society . . .	£1,945,675	19	2
Reserve Fund	174,324	13	6
Total	£2,120,000	12	8

consisting of Investments in the Public Funds, Loans to Assurers on their Policies, Agents and Bankers, Balances, and Policy Stamps.

The total number of Life members amounted to 6,892, and the number of Annuitants, males and females, to 763. Of the latter, 260 were males, the youngest of whom was 24 and the oldest 90 years of age, and 503 females, the youngest being 17 and the oldest 101 years of age.

Comparative Statement of New Business for the years 1849 and 1850.

	1849.			1850.		
	No. of Pols. on Lives.	Sum Assured.	Premium.	No. of Pols. on Lives.	Sum Assured.	Premium.
Whole Life.	361	156,462 10 0	4,985 13 1	403	184,241 1 0	6,063 12 7
For Terms .	20	11,533 6 8	382 4 8	27	10,785 13 4	232 1 4
Special Contract	19	10,094 0 0	283 18 0	19	9,210 0 0	187 4 10
	400	178,029 16 8	5,651 15 9	449	204,236 14 4	6432 18 9

Annuities.

1849.		1850.	
No. of Policies.	Amount Sunk.	No. of Policies.	Amount Sunk.
68	19,177 2 5	72	29,083 15 3

THE INSTITUTE OF ACTUARIES.

The establishment of the "*Association of Managers of the Scottish Life Assurance Offices*" has, we believe we may say with perfect truth, been productive of the greatest advantage to the public, the offices, and the managers themselves. By its means the latter have been enabled to attain to a consistency of principles, and an uniformity of practice, tending powerfully to promote the welfare of their Companies, and to secure for them the respect and confidence of the public. Relieved from the weight of an unpleasing and unnecessary responsibility, each member of the Association, informed by the knowledge and strengthened by the opinions of the rest, is in a position to exercise, in his own particular sphere of action, that wholesome influence and control so essential to the proper conduct and government of the complicated machinery which it is his peculiar province to regulate, and which, directed by unskilful hands, must so soon relapse into inextricable disorder. Bound together by their common interests, and stimulated only by a generous and liberal rivalry, they form a phalanx sufficiently strong to resist by its moral force, the encroachments of irregular enterprises, and to suppress such as are of a more doubtful character; and thus the great and important objects which these Institutions have in view, are carried out in the sister kingdom in the most economical, advantageous, and effective manner.

It must, we think, be admitted, that had such an Association been formed at an early period amongst the Managers or Actuaries of the London Offices, many of the existing evils connected with the business of Life Assurance in England would not have arisen. There appears to be no sufficient reason why such a measure should not have been attended with the same results here as in Scotland. Organization and unity of action once established amongst the Companies first formed, would have tended to retard that rapid increase in their numbers which is operating now so disadvantageously. The managers themselves would have been able from time to time to devise the means of checking that unwholesome growth. Better informed generally, and supported by the co-operation of all, each would have been enabled to inspire greater confidence, and to maintain a more influential position. The necessity for retaining, in every case, the services of one so endowed, would have been more fully recognised and steadily kept in view, and greater difficulty would have attended the establishment of a Company where the aid of such an officer was not obtained—whilst, on the other hand, persons of such character and standing would not have lent themselves to the furtherance of undertakings of a doubtful or illegitimate description.

The apparently obvious remedy which these observations point out, viz., the immediate resort to a precisely similar association, is unfortunately not now practicable, as regards the whole body; the number of offices is so great, that an assembly which included all their managers would be too large for the convenient discussion of the questions likely to come before them—whilst the body would not be content to conform in such matters to the decisions of a few selected from amongst them. In the lapse of time too, many, if not all, are committed to certain modes of procedure, and cannot now retrace their steps; moreover, their very want of union, has not only created a great diversity of practice, but has very materially led to the placing many in a position deprived of that controlling or guiding power without which their knowledge and experience are all but unavailing; and many would thus be quite unable to carry out measures previously determined upon, let them be ever so well calculated for the general advantage.

We believe that it was such considerations as these—felt, though not expressed—as led to the *Institute of Actuaries* taking the peculiar character and features which it did, immediately upon its creation.—It was felt that nothing could be more futile than to meet for the purpose of agreeing to that which it was known could not be agreed to, and of resolving what it would not, in many cases, be possible to execute. Minor associations, it was true, could be formed of a more or less exclusive character; and, as regarded the managers of offices of similar calibre and analogous interests, could no doubt be formed, especially for official purposes, with some prospect of advantage: but these alone would have rather tended to perpetuate the antagonisms which discordant interests had already created, and could never have brought about any improvement in the condition of the general body, or have effected any change which would be calculated for its permanent advancement.

A little consideration sufficed to show that the evils which called for remedy had taken deeper root, and required more radical reformation; a more widely extended knowledge of principles was seen to be necessary, and a better acquaintance with the methods of applying them, before so many different views were likely to be reconciled, and when this should be achieved, there would still be wanting the power required to give effect to those more carefully elaborated opinions. Thus it became evident that the whole body must acquire a greater public consideration, before it could be useful in repressing the dangerous abuses so prevalent on every side, and in securing for the system that consistency and purity in its operation, without which it was likely to become a public pest, rather than a public blessing. Hence the Institute immediately upon its development, assumed almost involuntarily, a collegiate or educational character, and, while it sought to comprehend within its bounds all the existing members of the profession, and to afford them the means of intercommunion and discussion, strove to foster and encourage the learning peculiar to their pursuits, to improve the existing modes of practice, and to fix its mark on such as might thereafter distinguish themselves for the attainment of the one, or the exhibition of greater skill in the other. It was felt that a certain power was wanting, and it was seen that the acknowledged possession of the required learning and experience would be likely to confer that power.

With what success this measure has been hitherto attended, we will not at this stage of it stop to enquire, but from what we have already seen, we feel confident in predicting that concurrently with the rapid growth and vigorous maturity of the Institute, a better order of things will speedily develope itself; an improved tone will take the place of the very indifferent one heretofore perceptible; more just and liberal and accurate ideas on the several points connected with the common pursuit, will be prevalent, and greater confidence exhibited in the enunciation of them; differences in practice will vanish with differences of opinion; armed with the moral power thus gradually acquired, and, it may be, shielded by legal protection, the profession will ultimately assume in England as well as in Scotland that position, the attaining of which we have all along insisted upon, as essential to the due protection of private as well as public interests; and which, enabling it to give the proper direction to honest and legitimate enterprizes, will place in its hands the means of exposing and extinguishing such as are of an unsound or delusive description, and of putting a stop to the mischievous expedients to which their projectors may, from time to time, think proper to resort.

Proceedings of the Institute of Actuaries of Great Britain and Ireland.

First Sessional Meeting, 1850-51; 25th Nov. 1850.

Mr. Jellicoe, V.P., in the Chair.

The minutes of the last sessional meeting having been read and confirmed, the Vice-President announced that the following contributions had been made to the Library:—

	Presented by
Milne on Annuities, 2 vols.	Mr. Cleghorn.
Gardiner's Logarithms, 1742	Mr. Wagner.
Addison's Works, 4 vols.	Mr. P. Hardy, V.P.

	Presented by
Life of Lord Chancellor Bacon	Mr. P. Hardy, V.P.
Boyle's Experiments on Air	Do.
Brown's Mathematical Tables	Do.
Report on Church Leases	Do.
Cleland's Glasgow Statistical Tables	Do.
Report on Drunkenness	Do.
Geographical Dictionary, 2 vols.	Do.
The Justice, &c. of an Income or Property Tax	Do.
Nicholson's Dictionary of Chemistry	Do.
Population Abstracts of Great Britain, 1811	Do.
Transactions of the Statistical Society, 1837	Do.
Sturmin's Course of Mathematics, 3 vols.	Do.
Walter's Mathematical Dictionary	Do.
Bonycastle's Trigonometry, 2nd Ed.	Mr. Jenkin Jones
British Almanack and Companion for 1850	Do.
Papers of the Central Society of Education	Do.
Minutes of the Committee of Council on Education, 1839-40	Do.
Do. Do. 1840-1	Do.
Do. Do. 1842-3	Do.
Do. Do. 1844	Do.
Francœur's Pure Mathematics, 2 vols.	Do.
Hirsch's Geometry	Do.
Report on Local Taxation	Do.
Ludlam's Rudiments of Mathematics	Do.
Metropolitan Sanitary Commission, 1848	Do.
Report on the Continuance of the Poor Law Commissions	Do.
Poor Law Commissioner's 2nd Annual Report 1836	Do.
Do. 3rd Do. 1837	Do.
Do. 4th Do. 1838	Do.
Do. 5th Do. 1839	Do.
Do. 6th Do. 1840	Do.
Do. 7th Do. 1841	Do.
Do. 9th Do. 1843	Do.
3 Reports on the Irish Poor Law	Do.
Extracts from the 3 Reports on the Irish Poor Law	Do.
Registrar General's 1st Annual Report 1839	Do.
Do. 3rd Do. 1841	Do.
Do. 4th Do. 1842	Do.
Sanitary Enquiry, England, 1842	Do.
Do. Scotland, 1842	Do.
Working Man's Year Book, 1835	Do.
Essay on Annuities, by a Military Fund Director, with an Appendix	Mr. Noble.
Reports on the Mining Districts	Mr. Colvin.
Saunderson's Algebra	Do.
Simpson's Algebra	Do.

	Presented by
Simpson's Fluxions, 2 vols.	Mr. Colvin.
Whiston's Elementa Geometriæ	Do.
Ansell, on Friendly Societies	Mr. Higham.
Corbaux, on Population, Vitality, and Mortality	Do.
De Morgan, on Probabilities	Mr. Winser.

It was resolved unanimously that the thanks of the meeting be given to the above mentioned gentlemen, severally, for their liberal donations to the library.

The Meeting was also informed that the Council had made the following purchases for the library:—

Alison's History of Europe, 7th Ed., 20 vols.
Cooper's Surgical Dictionary.
Cuvier's Animal Kingdom.
Encyclopœdia Metropolitana, 30 vols.
Fariday's Electricity, 2 vols.
Hooper's Medical Dictionary.
Kirby and Spence's Entomology, 2 vols.
Macaulay's England, 2 vols.
Macaulay's Historial Essays.
McCullock's Geographical Dictionary, 2 vols.
McCullock's Dictionary of Commerce.
Murray's Encyclopœdia of Geography.
Phillips' Geology, 2 vols.
System of Universal Geography.
Tredgold, on the Steam Engine.
Turner's Chemistry.
Walker, on the Electric Telegraph.

Mr. Peter Hardy, V.P., then read a paper "On the values of Annuities, which are to pay certain given rates of interest on the purchase money during the whole term of their continuance, and to replace their original values on their expiration, at certain other given rates."

We devote, with much pleasure, a few pages of the *Magazine* to the following paper furnished by Mr. Porter. The manner in which he has treated the several questions appears to us to be well worthy of the consideration of the junior members of the profession. The solutions to the questions proposed at the second day's examination will, we hope, appear in our next number; and the future candidate for the Institute's certificate then having one complete type of the process before him, will, we trust, derive from it useful hints for his own guidance.

Solutions of the Questions proposed to Candidates for the "Certificate of Competency," at the First Examination held on the 10*th and* 11*th June,* 1850; *with an Investigation of the principal Formulæ required in their Solution.* By H. W. Porter, Esq., of the Alliance Life Assurance Company.

Note.—In presenting to the readers of the *Assurance Magazine* the following solutions, it is necessary to state, that as the space allotted for them in its pages is but limited, it has been necessary to abridge the answers to the questions as much as possible.

Plain and simple solutions of each question have been aimed at throughout; and it will be borne in mind that they are intended, not for the instruction of the senior members of the actuarial profession, but for the information and guidance of junior students.

Where the investigation of some of the formulæ required in the solution of the questions has been considered necessary, the matter will be found enclosed within brackets.

The questions proposed at the *vivâ voce* examination are divided into two sections, the one theoretical and the other practical.—*H. W. P.*

Examination Paper.—Monday, 10th June, 1850.

"*Levia quidem hæc, et parvi forte, si per se spectentur, momenti. Sed ex elementis constant, ex principiis oriuntur omnia. Et ex judicii consuetudine in rebus minutis adhibita pendet sæpissime, etiam in maximis, vera atque accurata Scientia.*"—Clarke's Homer's Iliad: Preface.

1. Show how a decimal quantity can be expressed in the form of a vulgar fraction.

Decimal fractions are such as have for their Denominators 10 or some power of 10, and these reduced to their lowest terms, give the equivalent vulgar fractions.

Ex. $\cdot 245 = \frac{245}{1000} = \frac{49}{200}$

2. Find the fractional value of the recurring decimal ·27272727.

Let $\cdot 27272727 = S$

Multiplying both sides of the equation by 100, we have

$$27\cdot 272727 = 100\ S$$

Then by subtracting the former equation from the latter,

$$27 = 99\ S$$

$$\therefore S = \frac{27}{99} = \frac{3}{11}.$$

[Note.—Recurring decimals are made up of quantities in Geometrical Progression, where $\frac{1}{10}, \frac{1}{100}, \frac{1}{1000}$, &c. is the Common Ratio, according as one, two, or three figures recur. Thus ·27272727 is equivalent to the Geometrical Series,

$$\frac{27}{10^2} + \frac{27}{10^4} + \frac{27}{10^6} + \text{\&c.} \ldots\ldots \text{ ad infinitum,}$$

and may be summed by applying the formula $S = \frac{a}{1-r}$. (*vide* note to question No. 4, second day's paper),

where $a = \frac{27}{10^2}$, and $r = \frac{1}{10^2}$

$$\therefore S = \frac{\frac{27}{10^2}}{1 - \frac{1}{10^4}} = \frac{27}{99} = \frac{3}{11} \text{ as before.]}$$

3. Find by logarithms the cube root of a number whose square root is 86·37129.

Since the square root of the number $= 86{\cdot}37129$ $\therefore$ the number itself $= (86{\cdot}37129)^2$, and its cube root $= (86{\cdot}37129)^{\frac{2}{3}}$ to find which

$$\begin{array}{rl} \lambda\ 86{\cdot}37129 = & 1{\cdot}9363679 \\ & \phantom{1{\cdot}93636}10 \\ & \phantom{1{\cdot}93636}46 \\ \hline & 1{\cdot}93636936 \\ & \phantom{1{\cdot}9363693}2 \\ \hline & 3)3{\cdot}87273872 = \lambda \text{ number required.} \\ \hline & 1{\cdot}2909129 = \lambda \text{ cube root.} \end{array}$$

and the Natural Number equivalent to this is 19·53934.

4. Find the amount of £375, in 50 years, at £5 per cent. per annum, compound interest; and the present value of £500, to be received at the end of 14 years at 3 per cent. per annum, compound interest.

(1) Let s = the amount.
p = the principal.
n = the number of years.
i = the interest of £1 for 1 year.

Then $s = p(1+i)^n$ and $\lambda s = \lambda p + n.\lambda(1+i)$

$p = £375, \quad n = 50, \quad i = {\cdot}05$

$$\begin{array}{rlrl} \lambda 375 = & 2{\cdot}5740313 & \lambda 1{\cdot}05 = & {\cdot}0211893 \\ & 1{\cdot}0594650 & & 50 \\ \hline & 3{\cdot}6334963 \quad \text{N} = 4300{\cdot}275 & & 1{\cdot}059465 \end{array}$$

£4,300 5s. 6d.

(2) $p = \dfrac{s}{(1+i)^n} = s \times (1+i)^{-n}$ and $\lambda p = \lambda s - n\,\lambda.(1+i)$

$s = £500, \quad n = 14, \quad i = {\cdot}03$

$$\begin{array}{rlrl} \lambda 500 = & 2{\cdot}6989700 & \lambda 1{\cdot}03 = & {\cdot}0128372 \\ & {\cdot}1797208 & & 2 \\ \hline & 2{\cdot}5192492 \quad \text{N} = 330{\cdot}5592 & & {\cdot}0256744 \\ & & & 7 \\ \hline & & & {\cdot}1797208 \end{array}$$

£330 11s. 2d.

5. Solve the general quadratic equation $px^2 - qx + r = o$, and show that the sum of the roots is equal to $\frac{q}{p}$, and their product to $\frac{r}{p}$.

(1) Multiplying by $4p$ the equation becomes

$$4p^2x^2 - 4pqx = -4pr$$

Adding to each side of the equation q^2, we have

$$4p^2x^2 - 4pqx + q^2 = q^2 - 4pr.$$

Extracting the square root,

$$2px - q = \pm\sqrt{q^2 - 4pr}$$

$$\therefore \quad x = \frac{\pm\sqrt{q^2-4pr}+q}{2p}$$

(2) The roots are $+\frac{\sqrt{q^2-4pr}+q}{2p}$ and $-\frac{\sqrt{q^2-4pr}+q}{2p}$

∴ by addition of these quantities we have $\frac{q}{p}$.
and by multiplication,

$$\frac{q+\sqrt{q^2-4pr}}{2p}\times\frac{q-\sqrt{q^2-4pr}}{2p}=\frac{4pr}{4p^2}=\frac{r}{p}$$

6. Solve the equation $\sqrt[m]{(1+x)^2}-\sqrt[m]{(1-x)^2}=\sqrt[m]{1-x^2}$.

It is convenient to change the form of this expression to that of fractional Indices.

$$(1+x)^{\frac{2}{m}}-(1-x)^{\frac{2}{m}}=(1-x^2)^{\frac{1}{m}}$$
$$(1+x)^{\frac{2}{m}}-(1-x)^{\frac{2}{m}}=(1+x)^{\frac{1}{m}}(1-x)^{\frac{1}{m}}.$$

Dividing by $(1-x)^{\frac{2}{m}}$

$$\left(\frac{1+x}{1-x}\right)^{\frac{2}{m}}-1=\left(\frac{1+x}{1-x}\right)^{\frac{1}{m}}$$

or

$$\left(\frac{1+x}{1-x}\right)^{\frac{2}{m}}-\left(\frac{1+x}{1-x}\right)^{\frac{1}{m}}=1$$

Now, completing the square, by adding to each side the square of half the coefficient of the 2nd term:

$$\left(\frac{1+x}{1-x}\right)^{\frac{2}{m}}-\left(\frac{1+x}{1-x}\right)^{\frac{1}{m}}+\frac{1}{4}=1+\frac{1}{4}\text{ or }\frac{5}{4}$$

and

$$\left(\frac{1+x}{1-x}\right)^{\frac{1}{m}}-\frac{1}{2}=\pm\frac{\sqrt{5}}{2}$$
$$\left(\frac{1+x}{1-x}\right)^{\frac{1}{m}}=\frac{1\pm\sqrt{5}}{2}$$

Raising both sides to the *m*th power,

$$\frac{1+x}{1-x}=\left(\frac{1\pm\sqrt{5}}{2}\right)^{m}$$

∴ Componendo et dividendo,

$$\frac{1+x+(1-x)}{1+x-(1-x)}=\frac{(1\pm\sqrt{5})^m+2^m}{(1\pm\sqrt{5})^m-2^m}$$

$$\therefore \quad \frac{1}{x}=\frac{(1\pm\sqrt{5})^m+2^m}{(1\pm\sqrt{5})^m-2^m}$$

$$\therefore \quad x=\frac{(1\pm\sqrt{5})^m-2^m}{(1\pm\sqrt{5})^m+2^m}.$$

7. Find the sum of the series 1, 3, 6, 10, &c. to n terms (the second differences being supposed constant.)

If a, b, c, d, &c. be the terms of a series whose first, second, third, &c. differences are expressed by $\delta 1$, $\delta 2$, $\delta 3$, &c., then the sum of n terms of the series is,

$$na + n.\frac{n-1}{2}.\delta_1 + n.\frac{n-1}{2}.\frac{n-2}{3}.\delta_2 + \&c. \ldots\ldots \text{ (\textit{vide} note.)}$$

(In the given series the second differences being supposed constant, it is not necessary to write down any more terms.)

$$\begin{array}{ccccccc} 1, & & 3, & & 6, & & 10 \\ & 2 & & 3 & & 4 & \\ & & 1 & & 1 & & \\ & & & 0 & & & \end{array}$$

Here $a = 1$, $\delta_2 = 2$, $\delta_1 = 1$, $\delta_2 = o$

$$\therefore \text{ the sum is } n + n.\frac{n-1}{2}.2 + n.\frac{n-1}{2}.\frac{n-2}{3}$$

$$= n + n.\overline{n-1} + n.\frac{n-1}{2}.\frac{n-2}{3}.$$

$$= n^2 + n.\frac{n-1}{2}.\frac{n-2}{3}.$$

[Note.—To investigate formulæ for the summation of series by the differential method.

Let a, b, c, d, e, f, g, &c., be a series following a regular law:

$$\text{And let } \left.\begin{aligned} b-a &= a' \\ c-b &= b' \\ d-c &= c' \\ e-d &= d' \\ f-e &= e' \end{aligned}\right\} \text{ Then } a, b, c, d, \text{ \&c. are called the 1st order of differences.}$$

$$\left.\begin{aligned} b'-a' &= a'' \\ c'-b' &= b'' \\ d'-c' &= c'' \\ e'-d' &= d'' \\ f'-e' &= e'' \end{aligned}\right\} \quad a'', b'', \text{ \&c.} \qquad \text{2nd order of differences.}$$

$$\left.\begin{aligned} b''-a'' &= a''' \\ c''-b'' &= b''' \\ d''-c'' &= c''' \\ e''-d'' &= d''' \\ f''-e'' &= e''' \end{aligned}\right\} \quad a''', b''', \text{ \&c.} \qquad \text{3rd order of differences.}$$

and so on.

1st proposition.
To find the nth order of differences, *i.e.* to find a general expression.

$$\begin{aligned} \text{From above } a'' &= b'-a' = c-b-(b-a) = c-2b+a \\ b'' &= c'-b' = d-c-(c-b) = d-2c+b \\ c'' &= d'-c' = e-d-(d-c) = e-2d+c \\ d'' &= e'-d' = f-e-(e-d) = f-2e+d \end{aligned}$$

$$\begin{aligned} \text{also } a''' &= b''-a'' = d-2c+b-(c-2b+a) = d-3c+3b-a \\ b''' &= c''-b'' = e-2d+c-(d-2c+b) = e-3d+3c-b \\ c''' &= d''-c'' = f-2e.d-(e-2d+c) = f-3e+3d-c \end{aligned}$$

and similarly,

$$\begin{aligned} a'''' = b'''-a''' &= e-3d+3c-b-d+3c-3b+a \\ &= e-4d+6c-4b+a \end{aligned}$$

Hence we conclude generally, that the law holds, which is, that the coefficients follow the same law as the coefficient of $(a-x)^n$. (*vide* question 13, Binomial theorem.)

Now, writing the above in reversed order we have,

$$\begin{array}{lll} a' & = & -(a-b) \\ a'' & = & a-2b+c \\ a''' & = & -(a-3b+3c-d) \\ a'''' & = & a-4b+6c-4d+e \\ \&c. & & \&c. \end{array}$$

$$\therefore \quad a^n = \pm\left(a-nb+n\,.\,\frac{\overline{n-1}}{2}\,.\,c-n\,.\,\frac{\overline{n-1}}{2}\,.\,\frac{\overline{n-2}}{3}\,.\,d+\&c.\ .\ .\ .\right.$$

+ or — according as n is even or odd, and upon this depends the system of interpolation.

It is important to observe here that the coefficients of the

$$\begin{array}{lll} \text{2nd term are as if from} & & (1+x)^1 \\ \text{3rd} & ,, & (1+x)^2 \\ \text{4th} & ,, & (1+x)^3 \\ \quad\&c. & \&c. & \\ \therefore & & \\ (n+1)\text{th} & ,, & (1+x)^n \\ \text{and} & & \\ n\text{th} & ,, & (1+x)^{n-1} \end{array}$$

2nd proposition.

To find the $(n+1)$th term of the above series.

The series is,

$a,\ b,\ c,\ d,\ e,\ f,$ &c.

$$\begin{array}{lllll} \text{and the 2nd term} & b = a+a' & & & \\ \text{3rd} \quad ,, & c = b+b' & = & a+a'+a'+a'' & = a+2a'+a'' \\ \text{4th} \quad ,, & d = c+c' & = & (a+2a'+a'') + (b'+b'') & \\ & & = & (a+2a'+a'') + (a'+a''+a''+a''') & \\ & & = & (a+2a'+a'') + (a'+2a''+a''') & \\ & & = & a+3a'+3a''+a'''. & \end{array}$$

and so on.

$$\therefore \quad (n+1)\text{th term} = a+na'+n\,.\,\frac{n-1}{2}\,.\,a''+n\,.\,\frac{n-1}{2}\,.\,\frac{n-2}{3}\,.\,a'''+\&c$$

3rd proposition.

To express the sum of the series.

The $(n+1)$th term of the series

$0,\ a,\ a+b,\ a+b+c,\ a+b+c+d,$ &c.

is the sum of n terms of the series

$a+b+c+d+$&c.

and we have the series

$0,\quad a,\quad a+b,\quad a+b+c,\quad a+b+c+d,\quad$ &c.

$a-0,\ a+b-a,\ a+b+c-a-b,\ a+b+c+d-a-b-c,$ &c. . . . $\delta^0 = a$

or

$$\begin{array}{llllllll} a, & & b, & & c, & & d, & \\ & b-a & & c-b & & d-c & & \ldots\ \delta' = b-a \\ & & c-b-b+a & & d-c-c+b & & & \end{array}$$

or

$$\begin{array}{lll} c-2b+a & d-2c+b & \ldots\ \delta'' = c-2b+a \\ & d-2c+b-c+2b-a & \end{array}$$

or

$$d-3c+3b-a \qquad \ldots\ \delta''' = d-3c+3b-a$$

∴ we have

$$a+b+c+d+\ldots\ldots \text{ to } n \text{ terms.}$$

$$= 0+n\delta 0+\frac{n\,.\,\overline{n-1}}{2}\,.\,\delta 1+n\,.\,\frac{\overline{n-1}}{2}\,.\,\frac{\overline{n-2}}{3}\,.\,\delta 2+\ldots\ldots$$

$$= na+\frac{n\,.\,\overline{n-1}}{2}\,.\,\delta 1+n\,.\,\frac{\overline{n-1}}{2}\,.\,\frac{\overline{n-2}}{3}\,\delta 2+\ldots$$

δ in this proposition being put generally for a' b' c' &c. . .]

8. Find the sum of n terms of the series $1+2x+3x^2+4x^3+$ &c.

Let S = required sum.

$$\therefore S=1+2x+3x^2+4x^3+\ldots\ldots nx^{n-1}$$

Multiplying by x we have

$$xS=x+2x^2+3x^3+\ldots\ldots+(n-1)\,x^{n-1}+nx^n$$

Subtracting the latter equation from the former

$$S-xS=1+x+x^2+x^3+\ldots\ldots x^{n-1}-nx^n$$

which may be also expressed in the form

$$S\,(1-x)=\frac{1-x^n}{1-x}-nx^n$$

$$\therefore S=\frac{1-x_n}{(1-x)^2}-\frac{nx^n}{1-x}$$

9. Explain what is meant by the logarithm of a number, in respect to a given base, and express algebraically the relation between a number and its logarithm.

The logarithm of any number to a given *base* is the power to which the base must be raised to give that number.

Example.—If 2 is the base, then $2^5=32$ ∴ log. 32 is 5 to the base 2. 10, however, is the base used in all calculations.

If x is the logarithm of N to the base a, then the equation connecting a, N, and x, is $N=a^x$.

10. Explain the use of the table of proportionate parts in using tables of logarithms, and give an example of its application.

First, to form a table of proportionate parts,

Let log. 14430 = 159266 writing only the mantissæ or decimal part.
log. 14420 = 158965
Diffce 10 301

Here we see that if the 5th place be taken as the units place, the difference of 10 in the number gives a difference of 301 in the logarithm.

The question then arises, if 10 be added to the number 14420 for an addition of 301 to its logarithm, what must be added if 1, 2, 3, 4, &c. be respectively added.

Hence we have the following proportion :—

As 10 : 1 :: 301 : 30·1
10 : 2 :: 301 : 60·2
10 : 3 :: 301 : 90·3
10 : 4 :: 301 : 120·4
⋮ ⋮ ⋮ ⋮
10 : 9 :: 301 : 270·9

TABLE.

Differences.		
N	300	299
1	30	30
2	60	60
3	90	90
4	120	120
5	150	150
6	180	179
7	210	209
8	240	239
9	270	269

The same principle applies to the 6th place, except that 301 then corresponds to a difference of 100 instead of 10, and therefore the difference in the table must be divided by 10, which in practice is done by moving the difference one unit's place to the right.

Example from above table of differences.

Find the logarithm of 1442·139 of which the first 5 figures only are found at sight in ordinary tables of logarithms.

Log. 1442·1 = 3·1589954
Prop. parts from above table, difference being 299 } 3 90
9 269
3·15900709 = log. 1442·139

11. Find the number of permutations which can be effected with n distinct symbols.

Let there be n letters,

$$a_1 \quad a_2 \quad a_3 \quad a_4 \quad a_5 \quad a_6 \quad - \quad - \quad - \quad a_n$$

If we take away a_1 then $n-1$ letters only remain.

$$a_2 \quad a_3 \quad a_4 \quad a_5 \quad a_6 \quad - \quad - \quad - \quad a_n$$

Again placing a_1 before each.

$$a_1a_2 \quad a_1a_3 \quad a_1a_4 \quad - \quad - \quad - \quad - \quad a_1a_n$$

which gives $n-1$ permutations of n letters two and two in which a_1 stands first.

Adopting the same course with a_2

$$\begin{array}{cccccccc} a_2a_1 & a_2a_3 & a_2a_4 & - & - & - & - & a_2a_n \\ a_3a_1 & a_3a_2 & a_3a_4 & - & - & - & - & a_3a_n \\ \vdots & \vdots & \vdots & & & & & \vdots \\ a_na_1 & a_na_2 & a_na_3 & - & - & - & - & a_na_{n-1} \end{array}$$

each line containing $n-1$ combinations, and the number of the lines being n,

$\therefore$ whole number $= n\,.\,\overline{n-1}\,. = \mathrm{P}2$, or the permutations of n quantities taken two and two together.

Further,

Taking away a_1 and permuting the remaining $\overline{n-1}$ letters 2 and 2, we have by the first case $\overline{n-1}\,.\,n-2$ permutations.

$$a_2a_3 \qquad a_3a_4 \qquad - \quad - \quad - \quad - \qquad a_{n-1}\,a_n$$

Replacing a_1

$$a_1a_2a_3, \qquad a_1a_3a_4 \qquad - \quad - \quad - \quad - \qquad a_1a_{n-1}a_n$$

here then are $\overline{n-1}\,.\,\overline{n-2}$ permutations 3 and 3 together, where a_1 stands first, and similarly $\overline{n-1}\,.\,\overline{n-2}$ permutations where $a_2, a_3, \; - \; a_n$ stand first;

∴ whole number of permutations taken 3 and 3 together is $n\,.\,\overline{n-1}\,.\,\overline{n-2}$.

Further,

It seems probable, therefore, that the permutations of n letters taken r and r together.

$= n\,.\,\overline{n-1}\,.\,\overline{n-2} \quad - \; - \; - \; - \quad \overline{n-r-1}$

Let us for the present assume that this is true

Let there be n letters as before,

$a_1 \; a_2 \; a_3 \; a_4 \quad - \; - \; - \; - \; - \; - \; - \quad a_n$

and let a_1, be taken away and the remaining $\overline{n-1}$. letters be permuted r and r together.

Then the number is, $\overline{n-1}\,.\,\overline{n-2}\,.\,\overline{n-3}. \quad - \; - \; - \quad \overline{n-r}$

Now if the formula be true for r and r it is equally true for $r+1$ and $r+1$. But it has been proved to be true for 2 and 2 and 3 and 3. ∴ it is true for 4, and if for 4 for 5, &c., and ∴ it is true generally.

$$P2 = n\,.\,\overline{n-1}$$

$$P3 = n\,.\,\overline{n-1}\,.\,n-2$$

$$Pn = n\,.\,\overline{n-1}\,.\,n-2 \quad - \; - \; - \; - \quad \overline{n-r-1}$$

$$Pn = n\,.\,\overline{n-1}\,.\,\overline{n-2} \quad - \; - \; - \quad 3\,.\,2\,.\,1$$

12. Prove that the total number of different combinations of n things taken 1,2,3 . . . n at a time is 2^n-1.

$(a+x)^n =$ (expanding by the Binomial theorem.)

$$a^n + na^{n-1}x + \frac{n\,.\,\overline{n-1}}{1\,.\,2}a^{n-2}x^2 + n\,.\,\frac{\overline{n-1}\,.\,\overline{n-2}}{1\,.\,2\,.\,3}a^{n-3}x^3 \quad . \; . \; .$$

$$. \; . \; . \; . \; . \; . \; . \frac{n\,.\,\overline{n-1}}{1\,.\,2}a^{n-2}x^{n-2} + nax^{n-1} + x^n$$

Let $a=1$, $x=1$.

$$\therefore 2^n = 1 + n + \frac{n\,.\,\overline{n-1}}{1\,.\,2} + \frac{n\,.\,\overline{n-1}\,.\,\overline{n-2}}{1\,.\,2\,.\,3} + \&c. \; . \; . \; . \; . \; . \; . \; .$$

$$. \; . \; . \; . \; . \; . \; . \quad \frac{n\,.\,\overline{n-1}}{1\,.\,2} + n + 1$$

$$\text{And } 2^n - 1 = n + n\,.\,\frac{\overline{n-1}}{1\,.\,2} + n\,.\,\frac{\overline{n-1}\,.\,\overline{n-2}}{1\,.\,2\,.\,3} + \; . \; . \; \frac{n\,.\,\overline{n-1}}{1\,.\,2} + n + 1$$

$$= \quad C_1 \; + \; C_2 \; + \; C_3 \; + \; . \; . \; C_{n-2} + C_{n-1} + C_n$$

C_1, C_2, C_3, &c., representing the total number of combinations of N things taken 1 together, 2 together, 3 together, &c. . . n together.

[Note.—In this proof it has been assumed that the number of combinations of n things taken r and r together = the number taken $n-r$ together, which may be proved as follows:—

If we take n quantities $a_1, a_2, a_3, \ldots\ldots\ldots a_n$, and form any one combination of r of these quantities, those which remain will form a corresponding and supplementary combination of $n-r$ quantities; it follows ∴ that no combination can exist without its supplement, and consequently they must be equal in number.]

13. State and prove the Binomial theorem for the case where the index is a positive integer.

The Binomial theorem shows how to raise a Binomial to any power by an easier and shorter method than by repeated multiplication.

There are several proofs of the Binomial theorem, almost every writer on Algebra gives a different proof, perhaps the following is the most simple.

Let $(x+a)$ be a Binomial.

Its nth power or $(x+a)^n$ is

$$x^n + nax^{n-1} + n\,.\,\frac{n-1}{2}\,.\,a^2x^{n-2} + n\,.\,\frac{n-1}{2}\,.\,\frac{n-2}{3}\,.\,a^3x^{n-3} + \ldots\ldots$$

$$\ldots\ldots\ldots\ldots\ldots \frac{n\,.\,\overline{n-1}}{2}\,.\,a^{n-2}x^{n-2} + na^{n-1}x + a^n$$

Where the index of x beginning from n is diminished by unity, and the index of a beginning from o is increased by unity, also the coefficient of each term is found by multiplying the coefficient of the preceding term by the index of x in that term, and dividing by the index of a increased by unity.

To investigate the theorem when the index is a positive integer:

By actual multiplication of n quantities $(x+a)$, $(x+b)$, $(x+c,)$ &c., together, it appears that

$$(x+a)(x+b) = x^2 + (a+b)x + ab$$
$$(x+a)(x+b)(x+c) = x^3 + (a+b+c)x^2 + (ab+ac+bc)x + abc$$
$$(x+a)(x+b)(x+c)(x+d) = x^4 + (a+b+c+d)x^3 + (ab+ac+bc+ad+bd+dc).$$
$$\times x^2 + (abc+acd+adc+bcd)x + abcd$$

and the same law of the continued product is observed to hold, whatever be the number of Binomial factors $(x+a)$, $(x+b)$, $(x+c)$, &c., actually multiplied together; viz., that it is composed of a descending series of the powers of x, the index of the highest being the number of the factors and the other indices decreasing by unity in each successive term—also the coefficient of the first term is 1, of the second term the quantities a,b,c, &c., of the third, the sum of the product of every two, the fourth, the sum of the product of every three, and so on; of the last the product of all the n quantities a,b,c,d, &c.

Suppose then that this law holds for n Binomial factors

$$(x+a),\ (x+b),\ (x+c) \ldots\ldots (x+k) \text{ so that}$$
$$(x+a).\,(x+b).\,(x+c) \ldots\ldots (x+k) = x^n + Ax^{n-1} + Bx^{n-2} + Cx^{n-3} + \ldots\ldots K$$

Where $A = a+b+c+\ldots\ldots\ldots\ldots k$
$B = ab+ac+bc+ \ldots\ldots\ldots bk$
$C = abc+acd+\ldots\ldots\ldots\ldots bck$
&c.
$K = abcd\ldots\ldots\ldots\ldots k.$

Now if we introduce a new factor $(x+l)$ we have

$$(x+a)\,(x+b)\,(x+c)\dots(x+k)\,(x+l) = x^{n+1} + (A+l)\,x^{n} + (B+lA)\,x^{n-1} + \dots\dots\dots\dots\dots\, Kl$$

$$\begin{array}{lll} \text{Hence } A+l = & a+b+c+d+\dots\dots\dots & k+l \\ B+lA = & ab+ac+bc+\dots\dots\dots & al+bl+kl \\ \vdots & \vdots & \vdots \\ Kl = & abcd\dots\dots\dots\dots & kl \end{array}$$

So that we see if the law holds when n Binomial factors are multiplied together, the same law *is proved* to hold for $n+1$ factors.

But it has been shown to hold for four factors ∴ it is true for five, and if for five then also for six, and so on.

Now let $a = b = c = d =$ &c.

Then $A = a+a+a+a+\dots\dots$ to n terms $= na$

$B = a^2+a^2+a^2+\dots\dots\dots\dots$ to as many terms as there are combinations of n things taken 2 and 2 $\Big\} = n\,.\,\dfrac{n-1}{2}\,.\,a^2$

$C = a^3+a^3+a^3+\dots\dots\dots\dots$ to as many terms as there are combinations of n things taken 3 and 3 $\Big\} = n\,.\,\dfrac{n-1}{2}\,.\,\dfrac{n-2}{3}\,.\,a^3$

$\vdots \qquad \vdots \qquad\qquad \vdots \qquad\qquad \vdots$

$K = a\,.\,a\,.\,a\,.\,a\dots\dots\dots\dots\dots$ to n factors $= \qquad a^n$

Also $(x+a)\,(x+b)\,(x+c)\dots.(x+k)$ becomes $(x+a)^n$ ∴ $(x+a)^n$

$$= \quad x^n + nax^{n-1} + n\,.\,\frac{n-1}{2}\,.\,a^2\,x^{n-2} + \dots\dots\dots\dots\, a^n$$

14. A, B, C, D, E, &c., being any series whose fourth differences are Zero, express the value of E in terms of the preceding quantities.

The nth term of the above series is

$$a + (n-1)\,\delta 1 + (n-1)\,\frac{n-2}{2}\,.\,\delta 2 + (n-1)\,\frac{n-2}{2}\,.\,\frac{n-3}{3}\,.\,\delta 3 + \text{\&c.}$$

(*vide* Note to question 7)

$$\begin{array}{lll} & A \quad B \quad C \quad D \quad E & \\ & B-A,\ \ C-B,\ \ D-C,\ \ E-D = \delta_1 \text{ if a descending series} & \\ & C-B-B+A,\ \ D-C-C+B,\ \ E-D-D+C = \delta 2 & \\ = & C-2B+A,\ \ D-2C+B,\ \ E-2D+C & \\ & D-2C+B-C+2B-A,\ \ E-2D+C-D+2C-B = \delta 3 & \\ = & D-3C+3B-A,\qquad E-3D+3C-B & \\ & \qquad\qquad\qquad\qquad 0 = \delta 4 & \end{array}$$

The 4th differences being Zero

Then if E be the nth term, we have

$$A + (n-1)\,.\,\delta 1 + (n-1)\,.\,\frac{n-2}{2}\,.\,\delta 2 + (n-1)\,.\,\frac{n-2}{2}\,.\,\frac{n-3}{3}\,\delta 3 + 0$$

$$\text{or } A + (n-1)\,.\,(B-A) + (n-1)\,.\,\frac{n-2}{2}\,.\,(C-2B+A) +$$

$$+ \quad (n-1).\,\frac{n-2}{2}\,.\,\frac{n-3}{3}\,.\,(D-3C+3B-A)$$

Now writing for n its numerical value, 5, E being the fifth term, we have

$$\begin{aligned} &\mathrm{A} + 4\mathrm{B} - 4\mathrm{A} + 6\mathrm{C} - 12\mathrm{B} + 6\mathrm{A} + 4\mathrm{D} - 12\mathrm{C} + 12\mathrm{B} - 4\mathrm{A} \\ = &- \mathrm{A} + 4\mathrm{B} - 6\mathrm{C} + 4\mathrm{D}. \end{aligned}$$

15. The probability of the happening of an event in one trial being $\frac{a^1}{a}$, show the respective probabilities of the happening of the same event once only, and once at least in three trials.

(1.) The probability of the event happening at any given trial is $\frac{a^1}{a}$, and of its failing $1 - \frac{a^1}{a} = \frac{a-a^1}{a}$

$\therefore$ the chance of its happening once and failing twice is

$$\frac{a^1}{a} \times \frac{a-a^1}{a} \times \frac{a-a^1}{a} \text{ or } \frac{a^1 . (a-a^1)^2}{a^3}$$

Now there are three ways in which it may happen once and fail twice, *i.e.* it may happen, fail, fail,
or fail, happen, fail,
or fail, fail, happen.

Hence the probability required $= \frac{3a^1 (a-a^1)^2}{a^3}$

The condition of its happening once at least will be satisfied in any of these cases, *i.e.*,

1st. If it happen once and fail twice,
or 2nd. If it happen twice and fail once,
or 3rd. If it happen all three times.

The probability of the first is, as before $= \frac{3a^1 (a-a^1)^2}{a^3}$

Similarly the probability of the second $= \frac{3a^{1^2} (a-a^1)}{a^3}$

And the probability of the third .... $= \frac{a^{1^3}}{a^3}$

$\therefore$ the probability of the event happening once at least is the sum of these, viz. :

$$\frac{a^{1^3} + 3a^{1^2} (a-a^1) + 3a^1 (a-a^1)^2}{a^3}$$

Aliter (2)

Unless the event happen once at least, it will fail in all three trials, the probability of which is $\left(\frac{a-a^1}{a}\right)^3$ and the probability of its happening once at least is $\therefore 1 - \left(\frac{a-a^1}{a}\right)^3$.

16. What is the probability, according to De Moivre's hypothesis, that one or the other of three persons aged 20, will be alive at the end of 10 years?

De Moivre's hypothesis was suggested by Halley's Table, constructed from observations made in Breslau: he considered that of 86 persons born, one dies every year till all are extinct. The expectation of life by this hypothesis is always = half the number living at each age.

Upon this hypothesis, therefore, the number living at the age of 20 will be 66, and at 30 the number living will be 56. The chance, therefore, of one of the three living 10 years is $\frac{56}{66}$, and of one of the three dying within that period is $\frac{10}{66} = \frac{5}{33}$ and of all the three dying within 10 years, $\left(\frac{5}{33}\right)^3$

The probability ∴ that one or other will be living at the end of 10 years is $1-\left(\frac{5}{33}\right)^3$.

17. Find on the above-mentioned hypothesis, the present value of £250, to be received in the event of two persons, aged 30 and 50, both being alive at the end of 14 years, money being supposed to double itself in that time.

The number living on this hypothesis at the age of 30, is as before, 56, and at the age of 44 is 42; the probability, therefore, of a person aged 30 living 14 years, is $\frac{42}{56} = \frac{3}{4}$.

Similarly, the probability of a person aged 50 living 14 years, is $\frac{22}{36} = \frac{11}{18}$

∴ the probability of both being then alive, is $\frac{3}{4} \times \frac{11}{18} =$

$\frac{1}{4} \times \frac{11}{6} = \frac{11}{24} =$ ·45833, which decimal multiplied into £250, gives £114·583, the present value of £250 on the above contingency, irrespective of the interest of money.

This result multiplied by ·5, money being supposed to double itself in the given time, gives £57 5s. 10d. the required result.

Vivâ voce Examination.

Section I.

No. 1. What is the third power of $-\sqrt{-1}$.

$$(-\sqrt{-1})^3 = \sqrt{-1}.$$

2. What is the numerical value of the base e of the Naperian logarithms?

The value of e, which is a constant quantity, is 2·7182818 . . . .

[Note.—Napier, the inventor of logarithms, adopted this base because logarithms to it are more easily calculated than those to any other base.

All logarithm tables are first calculated to base e, and afterwards converted into Briggs' or common logarithms by multiplying by $\frac{1}{l_{e}10}$ the numerical value of which is ·434294819 . . . .

This is called the *modulus* of the system whose base is 10.

There are several formulæ for the calculation of logarithms.

Those generally made use of are the following:

$$l_{e}x = 2 \,.\left\{\frac{x-1}{x+1} + \frac{1}{3}\left(\frac{x-1}{x+1}\right)^3 + \frac{1}{5}\left(\frac{x-1}{x+1}\right)^5 + \dots\right\}$$

and having found $l_e x$

$$l_e(1+x) = l_e x + 2\left\{\frac{1}{2x+1} + \frac{1}{3}\cdot\frac{1}{(2x+1)^3} + \frac{1}{5}\cdot\frac{1}{(2x+1)^5} + \dots\right\}$$

This being a very rapidly converging series, the terms set down are probably sufficient for any practical purpose.

The investigation of these formulæ will be found in any treatise on the Theory of Logarithms.]

3. Define harmonical progression.

The quantities, A,B,C,D,E, are in harmonical progression, when

$$\begin{aligned} &A : C :: A-B : B-C \\ &B : D :: B-C : C-D \\ &C : E :: C-D : D-E \quad \text{\&c.} \end{aligned}$$

Also the Reciprocals of quantities in Harmonical Progression are in Arithmetical Progression.

By the definition, since

$$A : C :: A-B : B-C$$

$$\therefore\ AB - AC = AC - BC, \text{ and dividing by } ABC$$

$$\frac{AB}{ABC} - \frac{AC}{ABC} = \frac{AC}{ABC} - \frac{BC}{ABC}$$

$$\text{or}\quad \frac{1}{C} - \frac{1}{B} = \frac{1}{B} - \frac{1}{A}$$

Again since

$$B : D :: B-C : C-D$$

$$\therefore\ BC - BD = BD - DC, \text{ and dividing by } BCD$$

$$\frac{BC}{BCD} - \frac{BD}{BCD} = \frac{BD}{BCD} - \frac{DC}{BCD}$$

$$\text{or}\quad \frac{1}{D} - \frac{1}{C} = \frac{1}{C} - \frac{1}{B}$$

$$\text{and}\quad \frac{1}{C} - \frac{1}{B} = \frac{1}{B} - \frac{1}{A}$$

$$\therefore\ \frac{1}{A},\ \frac{1}{B},\ \frac{1}{C},\ \frac{1}{D}$$

have a common difference, and ∴ they are in arithmetical progression.

(To be continued in the next Number.)

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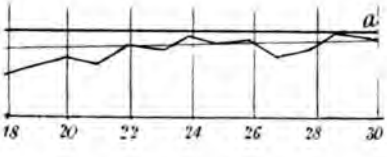

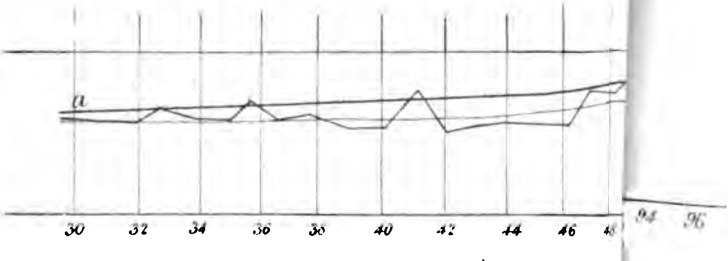

THE

ASSURANCE MAGAZINE.

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the true Measure of the Probabilities of Survivorship between two Lives. *By* Peter Gray, Esq., F.R.A.S.

[Read before the Institute of Actuaries, 27th of January, 1851.]

GOOD deal of misconception prevails, on the part of many terested in the science of life contingencies, in regard to the pressions usually assigned as the measures of the probabilities f the different orders of survivorship among two or more lives. t seems to be supposed that these expressions are little better han rude approximations, adopted from convenience or necessity, depending on no definite principles, and consequently giving results but little entitled to confidence. It appears to me that these notions are attributable, in no small degree, to the manner in which the expressions in question have been spoken of by the writers, Messrs. Morgan and Baily, by whom they were first deduced. Thus, Mr. Morgan says*, "As it is nearly an equal chance that either A or B dies first in any particular year, the first contingency (that of both lives failing in the first year, B last) may be fairly expressed by $\frac{a-b}{a} \times \frac{m-n}{m} \times \frac{1}{2}$;" and Mr. Baily says†, "In all these annual contingencies I have supposed it to be an *equal* chance that A dies before B, whatever may be the difference between the two ages; and though this is not strictly correct, except in those cases where the two lives are equal, yet as such chance is, in the present investigation, confined to *each particular year*, and, when applied practically, is involved with other quantities which very much diminish the error that would otherwise arise from this hypothesis, it would be needless to render the solution more complicated and intricate by aiming at greater exactness. It will however appear from this remark, that the result here obtained is only an *approximation* to the true value, which is more and more correct the further we continue the series." I think it is fairly deducible from these remarks, that neither of the writers was aware that the hypothesis as to the distribution of the yearly deaths (in connexion with which the entire difficulty consists), involved in the assumption of $\frac{1}{2}$ of which they speak, is one of which they freely make use in other investigations,—I mean that the deaths of each year are uniformly distributed over that year, which is the hypothesis in accordance with which the expressions for the mean duration of single and joint lives are usually assigned. Had they been aware of this, it is hardly conceivable that they would have thought it requisite on this occasion to employ the deprecatory and apologetic language above quoted.

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* Doctrine of Assurances, second edition, p. 161, note xvii.

† Doctrine of Life Annuities, p. 109, note.

It seems natural enough, when those by whom the expressions under consideration were devised speak of them in the terms cited, that many of those who come after them, not seeking to go further into the subject than their predecessors, should contentedly imbibe the views suggested, and thus come to look upon the expressions in question with feelings of distrust.

It is the object of the present paper to show, first, that the expressions usually assigned as the measures of the probabilities of survivorship of two lives are *rigorously true* on the hypothesis of a uniform distribution of the deaths of each year; secondly, that this hypothesis is by no means an unreasonable one, and that its results consequently cannot be far from the truth; and thirdly, by the employment of a different and unquestionably more accurate hypothesis, to show what the error of the usual hypothesis in extreme cases really is. I confine myself for simplicity to two lives, but the principles made use of are equally applicable to cases in which the number of lives involved is any whatsoever.

First, the problem to be solved is,—Required the probability that, of two lives now aged x and y respectively, the latter (y) will die in the nth year from the present time, and the former (x) be alive at the moment of (y)'s death. Agreeably to the usual notation, the tabular numbers now alive of the respective ages x and y, are denoted by l_x and l_y; the numbers who out of these enter upon the nth year are denoted by l_{x+n-1} and l_{y+n-1}; and the numbers who complete that year by l_{x+n} and l_{y+n} respectively. And hence the numbers of the two classes who die in the nth year fall to be denoted by $l_{x+n-1} - l_{x+n}$, and $l_{y+n-1} - l_{y+n}$ respectively. But for our present purpose it is convenient to employ a somewhat less cumbrous system of notation. Thus I shall denote the numbers of the two classes—

now alive, by . . . . A and B
who enter on the nth year, by . a and b
who survive that year, by . . . a' and b'
and who die in it, by . . . . d and d'

Now the event in question will happen if (y) die in the nth year, and (x) either survive it or die in it after (y). It has thus two ways of happening, and only two; namely, first, by (y) dying in the year and (x) surviving it; and secondly, by both lives failing in the year, (y) first of the two; and the total probability will be the sum of the two partial probabilities in respect of these ways. Now a partial probability is determined by supposing the way of occurrence which gives rise to it as certain to have place, and multiplying the probability derived from that supposition by the probability of the supposition. And this process is to be applied to each way of happening in succession.

Suppose then that the event is to happen in the first of the two ways. It is then certain to happen, the measure of which degree of probability is unity; and the probability of this way of happening being $\frac{a'}{A} \cdot \frac{d'}{B}$, or $\frac{a'd'}{AB}$, this is also, since it is unaffected by multiplication by unity, the partial probability in respect of the first way.

Suppose, again, that the event is to happen in the second way, namely, by both lives failing in the year, (y) first of the two. It is now necessary to make some hypothesis as to the distribution of the deaths of the nth year. Let this hypothesis be that the deaths of each class are uniformly distributed over the year. From this hypothesis it follows, that, before the year is entered upon, each of the two lives, (x) and (y), is as likely to die in any one portion of the year as in any other equal portion; for the measure of each such probability will be a fraction of which both the numerator and the denominator are constant. Both lives then being by the supposition certain to fail in the year, and each being, by the mode of distribution, as likely to fail in any one portion of it as in any other equal portion, it undeniably follows, that it is an even chance which of them shall fail the first; that is, in the second way of happening, the probability that either life, as (y), will fail before the other, (x), is $\frac{1}{2}$; and the probability of this way of happening being $\frac{d}{A}\cdot\frac{d'}{B}$, or $\frac{dd'}{AB}$, we have for the partial probability in respect of this way, $\frac{dd'}{AB}\times\frac{1}{2}$, or $\frac{\frac{1}{2}dd'}{AB}$. Hence, adding together the two partial probabilities we have obtained, we have for the total probability required,

$$\frac{a'd'+\frac{1}{2}dd'}{AB}, \text{ or } \frac{d'(a'+\frac{1}{2}d)}{AB}.$$

And if in this we restore the values of A, B, a', d and d', we finally obtain

$$\frac{1}{2}(p_{x.n-1}+p_{x.n})\,(p_{y.n-1}-p_{y.n}),$$

which is the usual expression*, $p_{x.n-1}$, &c. denoting the probability that (x) will live $n-1$ years, &c.

I do not expect that, although I have been so full, even to diffuseness, in the foregoing demonstration, those who have been accustomed to object to the expression deduced, will have their objection removed by what I have advanced. The objection is taken to the adoption of $\frac{1}{2}$ as the probability that, when both lives fail in the nth year, either of them, whatever may be the difference of their ages, will fail first. Now although I believe the demonstration to be upon that point, and according to the hypothesis assumed as to the distribution of the deaths, absolutely impregnable, I shall, to leave if possible no room for cavil, instead of seeking to strengthen it by further illustration, give another demonstration, to which I think there will be no room to take exception.

Retaining the symbols already employed, suppose that the nth year is divided into m equal parts, m being any whole number; then the probability that (x) will live over t of those parts (t being a whole number less than m), will be

$$\frac{1}{A}\left(a-\frac{td}{m}\right), \text{ or } \frac{1}{mA}(ma-td);$$

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* Jones, p. 151.

for, the deaths being uniformly distributed, those of each mth part of a year will be $\frac{d}{m}$, those of the t parts will be $\frac{td}{m}$, and hence the survivors of a who enter on the year, at the end of the t parts, will be $a-\frac{td}{m}$. Also, the probability that (y) will die in the tth part will be $\frac{d'}{m\text{B}}$, $\frac{d'}{m}$ being the number who, out of (y)'s class, die in each part, on the same hypothesis of uniformity of distribution. Hence, multiplying together these two probabilities, we have

$$\frac{d'}{m^2\text{AB}}(ma-td)$$

for the probability of the compound event, which consists in the failure of (y) in the tth part and the surviving of (x) at the end of that part. If, therefore, in the expression deduced we make t equal to 1, 2, 3 .... m successively, and add the results, the sum will be the probability that (y) will die in some one or other of the m parts into which the year is supposed to be divided, and that (x) will be alive at the end of the same part. Thus, replacing in the meantime by Q the factor $\frac{d'}{m^2\text{AB}}$, we have

$$\begin{array}{ll} t=1, & \text{Q}(ma-d) \\ t=2, & \text{Q}(ma-2d) \\ t=3, & \text{Q}(ma-3d) \\ \cdot\ \cdot & \quad\cdot\ \cdot \\ \cdot\ \cdot & \quad\cdot\ \cdot \\ \cdot\ \cdot & \quad\cdot\ \cdot \\ t=m, & \text{Q}(ma-md). \end{array}$$

Hence, restoring the value of Q, and since $1+2+3\ldots+m = \frac{m(m+1)}{2}$, we have for the probability in question,

$$\frac{d'}{m^2\text{AB}}\left(m^2a-\frac{m(m+1)}{2}d\right), \text{ or } \frac{d'}{\text{AB}}\left(a-\frac{m+1}{2m}d\right).$$

This, as just stated, is the probability that (y) will die in the nth year, and that (x) will survive him by a portion of time not exceeding one-mth part of a year. Now it is obvious, that as this term of probable survivorship is diminished, the compound event whose probability has just been determined will become more and more nearly assimilated to that whose probability we seek, and that without limit; and the requisite change will be made in the formula by supposing m, the number of the parts into which the year is divided, to increase without limit. Hence the limit of $\frac{m+1}{2m}$ being obviously $\frac{m}{2m}$ or $\frac{1}{2}$, we have for the required probability,

$$\frac{d'(a-\frac{1}{2}d)}{\mathrm{AB}}.$$

And this is the same as that already found; for, since $a-a'=d$, $\therefore a-\frac{1}{2}d=a'+\frac{1}{2}d$, by transposition.

It is possible that some, unaccustomed to the processes of the higher analysis, may object to the adoption of $\frac{1}{2}$ as the limit of $\frac{m+1}{2m}$, when m is indefinitely increased. Such may satisfy themselves that the error which *seems to them* to exist is inconceivably small, by assuming for m some high number, say 100,000,000 (which by the terms of the demonstration is allowable); then, $\frac{m+1}{2m}$ being *always* equal to $\frac{1}{2}+\frac{1}{2m}$, in this case it becomes $\frac{1}{2}+\frac{1}{200,000,000}$, the employment for which of $\frac{1}{2}$ is more than sufficiently near for all conceivable purposes.

Secondly. It being thus established that the expression usually assigned as the measure of the probability under consideration is rigorously true, on the hypothesis of a uniform distribution of the deaths of each year, I have now to adduce certain considerations tending to show that the adoption of the hypothesis in question cannot be productive of any error of moment.

1. A uniform distribution of the deaths of each year does not imply, as at first sight it might appear to do, a stationary rate of mortality during the periods of uniform distribution. It implies, on the contrary, a constantly increasing rate during those periods; for the probabilities, at the commencement of each succeeding equal portion of a year, of a specified life failing during that portion, form a series of increasing fractions; since the numerators (the numbers who die in each portion) are the same, and the denominators (the numbers who enter upon the successive portions, and out of whom consequently the deaths take place) are in a state of constant diminution. And this is a condition that there can be little doubt ought to be fulfilled by

any hypothesis as to the distribution of the deaths, in behalf of which a claim to be an approximation to the truth can be set up. It is true that, corresponding to variations in the yearly decrements, changes, more or less abrupt, in passing from one year to the next, may take place in the rate of increase spoken of, and that at those points the function may even undergo a sudden diminution. But similar changes must take place at the same points whatever hypothesis may be adopted; although, if this be well chosen, they may be made to assume a gradual instead of an abrupt character. According to De Moivre's hypothesis, the deaths are uniformly distributed over the whole of life; and it is well known how nearly the results of that hypothesis approximate to the truth during what may be considered the most important years of existence.

2. The probability under consideration consists of two portions, of which one is very much greater than the other; a, except in the very last years of existence, always greatly exceeds $\frac{1}{2}d$. Hence, as it is only in the estimation of the smaller portion that the necessity for taking account of the distribution of the deaths arises, it follows that a small error arising from the employment of any particular hypothesis will have a proportionately smaller effect on the total probability.

Thirdly. I am now, with a view to determine the amount in extreme cases of the error committed by the employment of the hypothesis of uniform distribution, to present a solution of the problem on another, and undoubtedly a more correct hypothesis. For facility in the treatment of the hypothesis in view, however, and indeed in that of any hypothesis which shall aim at greater accuracy than the one heretofore employed, it is desirable to be in possession of methods of greater power than that which has hitherto sufficed. The method I shall employ is that of the Calculus of Finite Differences, on the application of which to the summation of series a few words may be necessary.

Let $\phi(x)$ denote any function of x; and suppose that in this function x is changed into $x+1$. It will now be denoted by $\phi(x+1)$. The original function will consequently have undergone a change, received an accession of value (which may be either positive or negative according to circumstances) amounting to $\phi(x+1)-\phi(x)$, which is called the difference of $\phi(x)$, and is denoted by $\Delta\phi(x)$. It is the province of the Direct Calculus of

Differences to determine $\Delta\phi(x)$ for every form of $\phi(x)$. Again, consider $\phi(x)$ as a difference arising from a change of the kind just described in another function. The determination of this other function, which is called the primary function, or the finite integral of $\phi(x)$, and is denoted by $\Sigma\phi(x)$, is the province of the Inverse Calculus of Differences, and the process is called finite integration.

Now let S_x and S_{x+1} denote the sum of x and of $x+1$ terms of the same series respectively. It is obvious that the difference between these is the $(x+1)$th term, say u_{x+1}; that is, $S_{x+1}-S_x$, or $\Delta S_x = u_{x+1}$. Hence $\Sigma u_{x+1} = S_x$. Consequently, by the integration of the $(x+1)$th term, we obtain the sum of the series, and are thereby enabled to dispense with the cumbrous process that without this aid would be unavoidable.

As introductory to the application of this process to the new hypothesis, I shall here repeat, upon the principles just enunciated, the solution last given of the problem under consideration, upon the old hypothesis. Let α and β denote the probabilities that (x) and (y) will enter upon the nth year respectively. Then, upon the hypothesis of uniform distribution, the probabilities that they will be alive at the end of any portion of that year, as $\frac{t}{m}$, will be denoted by $\alpha+\frac{t}{m}\Delta\alpha$, and $\beta+\frac{t}{m}\Delta\beta$ respectively. Hence also, since $\beta+\frac{t-1}{m}\Delta\beta$ will be the probability that (y) will be alive at the end of the time $\frac{t-1}{m}$, the probability that he will die between $\frac{t-1}{m}$ and $\frac{t}{m}$, that is in the tth in order of the m parts into which the year is divided, will be

$$\beta+\frac{t-1}{m}\Delta\beta-\beta-\frac{t}{m}\Delta\beta^{*}=-\frac{1}{m}\Delta\beta.$$

Consequently, the probability of (y) dying in the tth part and (x) surviving it, will be

$$-\frac{1}{m}\Delta\beta\left(\alpha+\frac{t}{m}\Delta\alpha\right),\ \text{or}\ -\frac{1}{m^2}\Delta\beta(m\alpha+t\Delta\alpha).$$

Now changing t into $t+1$, integrating, and in the integral replacing t by m, we have for the probability in respect of the whole year,

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[*] Milne, p. 52. Mr. Milne's demonstration of the property here made use of has reference to entire years only; but the property is equally true of any portion of time.

$$-\frac{1}{m^2}\Delta\beta\left(m^2\alpha+\frac{m(m+1)}{2}\Delta\alpha\right),\quad\text{or}\quad -\Delta\beta\left(\alpha+\frac{m+1}{2m}\Delta\alpha\right).$$

Finally, taking the limit of $\frac{m+1}{2m}$, we have for the probability required,

$$-\Delta\beta(\alpha+\tfrac{1}{2}\Delta\alpha);$$

and this is the same as the expression already obtained, $\Delta\alpha$ and $\Delta\beta$ being essentially negative.

Now what after all is the defect of the hypothesis of uniform distribution, on which we have hitherto proceeded? Undoubtedly this: the mortality table shows a series of decrements in most cases varying from year to year, either by increase or decrease; and these yearly variations must unquestionably be held as indicating corresponding variations in the distribution of the mortality of the individual years, amongst the component parts of those years. Thus if, for example, the mortality of the $(n+1)$th year be greater than that of the nth, then the mortality during any portion of the nth year towards its close ought to be greater than the mortality during any equal portion towards its commencement, and *vice versâ*. It is here then that the hypothesis in question is defective, inasmuch as it assigns, in all cases, to equal portions of each year the same number of deaths. Thus, if the deaths of the nth year are 100, the uniform hypothesis would assign 25 of those to each quarter of that year, irrespective of the number of the deaths of the $(n+1)$th and following years; whereas if the deaths of the $(n+1)$th year are 132 or 68, the quarterly distribution of the nth year would undoubtedly be much better represented, in the one case by 22, 24, 26, 28, and in the other by 28, 26, 24, 22; because while those series give the deaths of the nth year correctly, their continuation for four terms further would give the deaths of the $(n+1)$th year correctly also.

Hence in assigning the present probability of a specified life being in existence at the end of a fractional part of the nth year (or, which is the same thing, the number surviving out of a given number now alive), it is necessary to take account of the deaths of the $(n+1)$th year, as well as those of the nth. Indeed, perfect accuracy would prescribe the taking account of the deaths of every year after the nth; but as the state of the decrement of the $(n+1)$th year exercises an incomparably greater influence on the distribution of the nth year than the state of the decrements in all the following years together, and as we should find that influence to be, even in extreme cases, comparatively small, it would be needlessly complicating our problem to go beyond the $(n+1)$th year. In accordance with this principle, the present probabilities of the specified life being alive at the end of $n-1$, n, and $n+1$ years, are treated as equidistant terms of a series, and the common formula of differences then enables us at once to assign any term intermediate to $n-1$ and n.

Let, as before,

$\alpha=$ the probability that (x) will live over $n-1$ years,

$\beta=$ the probability that (y) will live over $n-1$ years,

then, on the present hypothesis, the probability that (x) will be alive at the end of the time $\frac{t}{m}$ of the nth year (m being any whole number, and t not greater than m) will be,

$$\alpha+\frac{t}{m}\Delta\alpha+\frac{t(t-m)}{2m^2}\Delta^2\alpha\,; \quad . \quad . \quad . \quad . \quad . \quad (1.)$$

and the like probability for (y) will be

$$\beta+\frac{t}{m}\Delta\beta+\frac{t(t-m)}{2m^2}\Delta^2\beta. \quad . \quad . \quad . \quad . \quad . \quad (2.)$$

Also the probability that (y) will be alive at the end of the time $\frac{t-1}{m}$ will be

$$\beta+\frac{t-1}{m}\Delta\beta+\frac{(t-1)(t-m-1)}{2m^2}\Delta^2\beta. \quad . \quad . \quad . \quad (3.)$$

Consequently the difference of (2.) and (3.), or

$$-\frac{1}{m}\left(\Delta\beta+\frac{2t-m-1}{2m}\Delta^2\beta\right), \quad . \quad . \quad . \quad . \quad (4.)$$

will be the probability that (y) will die between $\frac{t-1}{m}$ and $\frac{t}{m}$. Hence, multiplying together (1.) and (4.), we have for the probability that (y) will die between $\frac{t-1}{m}$ and $\frac{t}{m}$, and that (x) will be alive at the end of $\frac{t}{m}$,

$$-\frac{1}{m}\left\{\alpha\,.\,\Delta\beta+\frac{t}{m}\Delta\alpha\,.\,\Delta\beta+\frac{t(t-m)}{2m^2}\Delta\beta\,.\,\Delta^2\alpha+\frac{2t-m-1}{2m}\alpha\,.\,\Delta^2\beta\right.$$
$$\left.+\frac{t(2t-m-1)}{2m^2}\Delta\alpha\,.\,\Delta^2\beta+\frac{t(t-m)(2t-m-1)}{4m^3}\Delta^2\alpha\,.\,\Delta^2\beta\right\}.$$

Writing in this expression $t+1$ for t, and integrating between the limits 0 and m, we have for the foregoing probability in respect of the whole of the nth year,

$$-\left\{\alpha\,.\,\Delta\beta+\frac{m+1}{2m}\Delta\alpha\,.\,\Delta\beta-\frac{m^2-1}{12m^2}\left(\Delta^2\alpha\,.\,\Delta\beta-\Delta\alpha\,.\,\Delta^2\beta-\frac{1}{2m}\Delta^2\alpha\,.\,\Delta^2\beta\right)\right\}.$$

Finally, increasing m without limit, we obtain for the probability required,

$$-\alpha\,.\,\Delta\beta-\frac{1}{2}\Delta\alpha\,.\,\Delta\beta-\frac{1}{12}(\Delta\alpha\,.\,\Delta^2\beta-\Delta^2\alpha\,.\,\Delta\beta).$$

I shall return to this expression. In the meantime I remark, that, much as the labour of the summation by which it is arrived at is reduced by the employment of the processes of the Calculus of Differences, it is still far from being inconsiderable. It will therefore perhaps be deemed not out of place if I briefly direct attention to another method, by the aid of which not only the hypothesis now under consideration, but also any other which it may be desired to examine, may be treated with great facility. The method now in view, which involves an elementary application of the Integral Calculus, is indicated by Professor De Morgan in the Third Appendix to his Essay on Probabilities, and there applied to the hypothesis at present under consideration. I need do little more than supply the necessary amplification*.

Let then ϕt and ψt (ϕ and ψ being as usual functional symbols) denote the probabilities that (x) and (y), now alive, shall be alive at the end of t years, t being whole or fractional. Let t become $t-\Delta t$; then, expanding by Taylor's theorem, the probability that (y) will be alive at the end of $t-\Delta t$, will be,

$$\psi t-\psi' t\,.\,\Delta t+\psi'' t\frac{(\Delta t)^2}{2}-\ldots.$$

where $\psi' t$, $\psi'' t$, &c. are the successive differential coefficients of ψt. But when Δt is diminished towards its limit dt, this becomes

$$\psi t-\psi' t\,.\,dt,$$

since $(\Delta t)^2$, &c. are infinitely small in comparison of Δt; and it then denotes the probability that (y) will be alive at the end of $t-dt$. Hence the probability that (y) will die between $t-dt$ and t, will be

$$(\psi t-\psi' t\,.\,dt)-\psi t=-\psi' t\,.\,dt.$$

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* I have however slightly modified the process to bring it into accordance with the foregoing investigations.

Consequently we have for the probability that (y) will die between $t-dt$ and t, and (x) be alive at the end of t,

$$-\phi t\,.\,\psi' t\,.\,dt.$$

And the integral of this expression, which is written thus,

$$-\int \phi t\,.\,\psi' t\,.\,dt,$$

between the limits $t=n-1$ and $t=n$, will be the probability that (x) will commence to survive (y) somewhere in the nth year.

This remarkable expression is quite general. It implies that, be the functions employed to denote the probabilities of (x) and (y) surviving the time t what they may, the integral of the product

$$-\phi t\,.\,\psi' t\,.\,dt,$$

between the specified limits, will always denote the probability of a survivorship of (x) commencing in the nth year.

Apply this expression to our present hypothesis, that is, let

$$\phi t=\alpha+t\Delta\alpha+\frac{t(t-1)}{2}\Delta^2\alpha,$$

and

$$\psi t=\beta+t\Delta\beta+\frac{t(t-1)}{2}\Delta^2\beta,$$

t denoting not, as formerly, a number, but a portion of time measured from the commencement of the nth year. Differentiating ψt, we have

$$\frac{d(\psi t)}{dt}, \text{ or } \psi' t=\Delta\beta+\left(t-\frac{1}{2}\right)\Delta^2\beta.$$

Hence, multiplying by ϕt, we have

$$\phi t\,.\,\psi' t=\alpha\,.\,\Delta\beta+t\Delta\alpha\,.\,\Delta\beta+\frac{t(t-1)}{2}\Delta^2\alpha\,.\,\Delta\beta+\left(t-\frac{1}{2}\right)\alpha\,.\,\Delta^2\beta$$
$$+t\left(t-\frac{1}{2}\right)\Delta\alpha\,.\,\Delta^2\beta+\frac{t\left(t-\frac{1}{2}\right)(t-1)}{2}\Delta^2\alpha\,.\,\Delta^2\beta.$$

Multiplying by dt, changing signs, and integrating between the limits $t=0$ and $t=1$, we have, finally, for the required probability,

$$-\int_0^1 \phi t\,.\,\psi' t\,.\,dt=-\alpha\,.\,\Delta\beta-\frac{1}{2}\Delta\alpha\,.\,\Delta\beta-\frac{1}{12}(\Delta\alpha\,.\,\Delta^2\beta-\Delta^2\alpha.\Delta\beta),$$

the fourth and sixth terms vanishing between the specified limits. And this is the expression already found, but it is here arrived at by a very much smaller expenditure of labour.

Now observe of this expression, that the first two terms of it are those that express the entire probability on our first hypothesis of uniformity of distribution. The remaining term is consequently the correction arising from the adoption of the new hypothesis. To put the expression in a form for use, substitute in it,

for α, $p_{x.n-1}$,

$\Delta\alpha$, $p_{x.n}-p_{x.n-1}$,

$\Delta^2\alpha$, $(p_{x.n+1}-p_{x.n})-(p_{x.n}-p_{x.n-1})=p_{x.n+1}-2p_{x.n}+p_{x.n-1}$;

and similarly for β, $\Delta\beta$ and $\Delta^2\beta$; and it then becomes

$$\frac{(p_{x.n-1}+p_{x.n})(p_{y.n-1}-p_{y.n})}{2}$$
$$-\frac{(p_{x.n-1}-p_{x.n})(p_{y.n}-p_{y.n+1})-(p_{x.n}-p_{x.n+1})(p_{y.n-1}-p_{y.n})}{12},$$

or

$$\frac{(l_{x+n-1}+l_{x+n})(l_{y+n-1}-l_{y+n})}{2l_{x.y}}$$
$$-\frac{(l_{x+n-1}-l_{x+n})(l_{y+n}-l_{y+n+1})-(l_{x+n}-l_{x+n+1})(l_{y+n-1}-l_{y+n})}{12l_{x.y}}.$$

As before, the first part of this expression is that which is usually given, and the second is the correction. This last, it is easy to see, must always be very small; for it consists of the difference of two products, both of which are small and very nearly equal, each factor in the one product having a corresponding and nearly equal factor in the other. The correction, for the same pair of lives, will be in some years positive, and in others negative; and it is worth while to remark, that it entirely vanishes, becomes rigorously zero, if for both lives the deaths of the nth and $(n+1)$th years are equal; that is, if the decrements of those years for both lives are stationary.

It is a practicable task now, from the second form of the expression above given, to determine the value of the correction for any year of the future existence of two lives, according to any table of mortality. I do not stop to give examples for single years, but proceed to deduce from the expression the corresponding form for the whole life. We have then for the total probability that of the two lives (x) and (y), (y) will die first,

$$\frac{1}{2}+\frac{N_{x.y-1}-N_{x-1.y}}{2D_{x.y}}$$
$$+\frac{(N_{x-1.y+1}+N_{x.y-1}+N_{x+1.y})-(N_{x-1.y}+N_{x.y+1}+N_{x+1.y-1})}{12D_{x.y}}.$$

This formula may be applied by means of Mr. Jones's Table XL.; and the following are a few results of its application. Of the two values corresponding to each pair of ages, the first, which is derived from the first two terms of the foregoing expression, is the usual approximation; and the second, which is derived from the remaining term, is the correction. In all the examples the correction is additive:—

PROBABILITY THAT (y) WILL DIE BEFORE (x).

x.	y.					
	30.	40.	50.	60.	70.	80.
20.	·625094 ·000050	·730322 ·000065	·811215 ·000043	·880591 ·000044	·928970 ·000058	·959724 ·000091
30.	....	·633800 ·000059	·749185 ·000076	·842126 ·000062	·903450 ·000061	·943960 ·000116
40.	....	....	·650231 ·000072	·787778 ·000115	·873990 ·000097	·925482 ·000142
50.	....	....	....	·684674 ·000125	·822997 ·000208	·907104 ·000296
60.	....	....	....	....	·677755 ·000157	·809907 ·000384
70.	....	....	....	....	....	·679920 ·000559

It is thus shown how small the correction is, within the limits which usually occur in practice; and when it is considered how laborious the application of the more correct formula is, I do not anticipate that it will often be thought necessary to have recourse to it. It is however now available for all who choose to make use of it.

The foregoing investigation gives, of course, an addition to the usual expression for the value of a survivorship assurance. The numerical value of the correction in this case will be considerably less than in the case that has been considered, in consequence of the entrance here of the element of interest. I subjoin the resulting formulæ, without examples:—

VALUE OF AN ASSURANCE OF £1 ON (y) AGAINST (x).

$$y>x$$

$$\frac{v(\mathrm{N}_{x-1\,.\,y-1}+\mathrm{N}_{x\,.\,y-1})-(\mathrm{N}_{x-1\,.\,y}+\mathrm{N}_{x\,.\,y})}{2\mathrm{D}_{x\,.\,y}}$$

$$-\frac{(\mathrm{N}_{x-1\,.\,y}-\mathrm{N}_{x+1\,.\,y})-v(\mathrm{N}_{x\,.\,y-1}-\mathrm{N}_{x+1\,.\,y-1})-(1+r)(\mathrm{N}_{x-1\,.\,y+1}-\mathrm{N}_{x\,.\,y+1})}{12\mathrm{D}_{x\,.\,y}}$$

$$y<x$$

$$\frac{v(\mathrm{N}_{x-1\,.\,y-1}-\mathrm{N}_{x-1\,.\,y})+(\mathrm{N}_{x\,.\,y-1}-\mathrm{N}_{x\,.\,y})}{2\mathrm{D}_{x\,.\,y}}$$

$$-\frac{v(\mathrm{N}_{x-1\,.\,y}-\mathrm{N}_{x-1\,.\,y+1})+(1+r)(\mathrm{N}_{x+1\,.\,y-1}-\mathrm{N}_{x+1\,.\,y})-(\mathrm{N}_{x\,.\,y-1}-\mathrm{N}_{x\,.\,y+1})}{12\mathrm{D}_{x\,.\,y}}.$$

I conceive that I have now established the positions with which I set out. I have *proved* that the expression usually assigned as the probability of one life surviving another is *rigorously true* on the hypothesis of a uniform distribution of the deaths of each year; and I have shown, by comparison of certain results of that hypothesis with the corresponding results of another, and unquestionably a more correct hypothesis, that the error arising from the employment of the first-mentioned hypothesis is so small as seldom to require to be taken into account. It will therefore now be for such of those who have followed me thus far, as demur to my conclusions, to show the fallacy of my demonstrations and the inconclusive character of my reasonings. Till this be done, I submit that I am warranted in viewing the questions in debate as set at rest.

London, 18th November 1850.

On the Contrivances required to render contingent Reversionary Interests Marketable Securities.

[Continued from No. 2.]

SINCE the loss occasioned by the reassurance varies with the mode of operation, it becomes interesting to inquire in which way the loss may be made the least possible. B is in the situation of a merchant who possesses a commodity not quite in a marketable state, and who seeks to bring it into a condition for sale at the least expense. A little reflection will show that the longer the borrowing is deferred, the less loss will B sustain, on account of the difference at interest; hence we must seek to diminish as much as possible the early payments, and to throw the weight of the premiums to a distant time—a scale of ascending premiums is thus the more advantageous for B. Now the most rapid rate of ascent which an assurance office can allow, is such that each premium may pay for the succeeding year's risk; no office, indeed, will go thus far*; yet it is worth while to examine this case, since it exhibits the minimum loss at which B can procure a reassurance.

Case 4.—Let the assurance of £1, payable at the death of B, if it happen while A is alive, be purchased from year to year at the price of each year's risk.

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* Some will.—Ed. A. M.

The successive payments, computed at 3 per cent., are given in the subjoined table:—

Ages.	Premium.	Ages.	Premium.
30 58	·00983	54 82	·01548
31 59	·00991	55 83	·01633
32 60	·00981	56 84	·01723
33 61	·00973	57 85	·01879
34 62	·00982	58 86	·02154
35 63	·00991	59 87	·02485
36 64	·01019	60 88	·02937
37 65	·01048	61 89	·03146
38 66	·01077	62 90	·03206
39 67	·01144	63 91	·03230
40 68	·01252	64 92	·03370
41 69	·01324	65 93	·03524
42 70	·01380	66 94	·03664
43 71	·01395	67 95	·03863
44 72	·01408	68 96	·04079
45 73	·01402	69 97	·04301
46 74	·01394	70 98	·04544
47 75	·01370	71 99	·05271
48 76	·01302	72 100	·05967
49 77	·01276	73 101	·06598
50 78	·01250	74 102	·07108
51 79	·01325	75 103	·06275
52 80	·01407	76 104	·05073
53 81	·01485		

And computing the present values of these contingent payments at 6 per cent., their sum comes to ·10022, which deducted from ·50280, leaves for B the balance ·40258. The loss occasioned by this form of the transaction is only ·00143.

This loss is scarcely one-third part of that occasioned by uniform annual premiums; the amount of it might have been readily obtained from other considerations, which throw additional light upon the influence exerted by the one transaction on the other.

The premium for one year's assurance depends very little on the rate of interest, and is just the probability of the death occurring within the year discounted for half a year; wherefore the numbers in the preceding table multiplied by $\sqrt{1{\cdot}03}$ would give the probabilities of B dying before A in each successive year. These probabilities, divided by $\sqrt{1{\cdot}06}$, would be the premiums exacted if the office did business at 6 per cent. Hence the 3 per cent. premiums multiplied by $\sqrt{\frac{1{\cdot}03}{1{\cdot}06}}$ would give the 6 per cent. premiums.

Now the 6 per cent. premium, estimated at 6 per cent., would just give for present value that of assurance at B's death if first, that is ·09879. Hence the present value of the 3 per cent. premiums must be $\cdot 09879 \times \sqrt{\frac{1{\cdot}06}{1{\cdot}03}}$, so that the loss to B occasioned by this form of the transaction is $\cdot 09879 \left\{ \sqrt{\frac{1{\cdot}06}{1{\cdot}03}} - 1 \right\}$ $= \cdot 00143$; that is, just about $1\frac{1}{2}$ per cent. on ·09879. It is as if the amount ·09879 were operated on for half a year at the two rates of interest. Hence if the premium were paid half-yearly or quarterly, according to the same plan the loss would be still further reduced; until, if we imagine the price to be paid each morning for the day's risk, the loss would be reduced to zero.

These discrepancies among the results of the various methods of effecting reassurances lead one to consider whether there be any intrinsic quality in contingent reversions which may render their conversion into absolute reversions a matter of necessity; and whether any distinct principle can be discovered which may serve to regulate the mode of conversion, or the difference between the market rates of interest to be charged for advances on the two kinds of security. In a strictly logical view, we cannot draw any line of demarcation between the two, for in either case the purchaser incurs the risk of losing a sum of money, whether it be the interest alone or the capital and interest jointly, and in return for this risk enjoys the chance of obtaining more than the sum expended with interest thereon; neither indeed is there any generic distinction recognized in practice, since even the scheme of reassurance shows that by the addition of two contingent reversions an absolute reversion is produced.

That there is no intrinsic quality in contingent reversions to render a higher rate of interest indispensable, may be made evident by the following view of two complementary transactions:

A property has been bequeathed in life-rent to A, and afterwards in reversion to B if B be alive at A's death, but if not to fall to C as absolute residuary legatee.

If, now, the two parties B and C come to an arrangement, they will be able jointly to offer for sale an absolute reversion to fall due at the death of A. For this the office would give the value computed at 6 per cent. without reassurance. But if B come alone and offer for sale his contingent reversion, then a higher per-centage on the expense of a reassurance is charged, while if C also separately sell his contingency, a similar charge is made: that is, on the supposition that the two kinds of reversions ought to be computed differently, the sum of the values of the two expectations is not equal to the value of the sum of those expectations.

Although, however, it appear from the above reasoning that there is no intrinsic distinction between absolute and contingent reversions as valued under fair and average circumstances, we must not conclude that there is nothing in the circumstances of the case which may call for a change in the manner of computation. It is well known that the advantage of selection is considerable, especially where the parties have an intimate knowledge of the habits and constitution of the nominee, and that that advantage is greater when there are two lives involved than when there is only one. The certificates of health only partially meet this advantage, and it is almost established that whenever a private bias operates extensively, all the care of the offices is insufficient to counteract it. In the above case we may imagine that A is a hale, temperate old man, whose years may be expected to run considerably beyond the average for his age. The two heirs B and C therefore agree together and sell their joint expectation; against this selection the office has no defence except by charging a higher rate. But if B and C should not agree, B may, feeling himself to be not better than an average life, sell his separate expectation of succeeding to A. Here there is the advantage of two selections, and at the same time one of these greatly enhanced in value by the mere introduction of a second life. Supposing the chance of unhealthiness in B to be met by the medical examination, still the benefit of selection would be greater in the contingent than in the absolute reversion, and therefore, viewing the subject in its whole extent, the offices are reasonably entitled to charge different rates for the two classes of reversions.

If the values of selection at different ages were known, the fair and proper charges could thence be computed without any change in the rate of interest, and the results so brought out would be intelligible and consistent with each other. The incongruity among the results arises from our being compelled to meet the selection in an indirect and not altogether proper way.

It is a matter of regret that the mutual jealousies of the offices prevent the accumulation of their experience on these points, and thus tend to cramp considerably the management of their business. The influence of selection cannot be represented by any bill of mortality. Thus the selection of A in the above case would not be properly allowed for by taking the mortality for the class of annuitants; but the calculation is of a special nature, having as its most important element the age of the party at the date of selection. On this important branch of life-statistics there are hardly any available data, and the reporter is therefore unable to give any satisfactory information.

From the above investigations, it will be seen that there are in general two methods of making the computations; one of these is to calculate the value of the absolute reversion formed, by adding together the original contingency and the assurance, and from that value to deduct the present value of the premiums to be paid to the assurance office, discounting these at 6 per cent. and allowing for the expectation of human life.

The second method is to take the difference between the premium actually charged by the office and that which would result from calculations at 6 per cent. The present value of that difference, estimated as above, is the loss arising from reassurance, which loss falls to be deducted from the value of the expectation actually possessed by B.

Having thus obtained the present advance to be made in consideration of a contingent reversion of £1, we must divide the proposed present advance thereby, in order to discover what sum must be secured.

In the above cases we have the following results:—

1. To cover an advance of £100, and also of the purchase-money (computed at 3 per cent.) for an assurance at the death of A, provided B be then dead, and also to cover interest at

6 per cent. for both advances, the sum of £273·93 must be secured at A's death if first, and also by assurance at A's death if second.

2. To cover a present advance of £100, and also of the price of an assurance at the death of B if it happens before A's, the sum of £266·31 must be secured, the assurance being also taken for that amount.

3. For the present advance of £100, and the current advance for the annual premium for assurance at the death of B if first, and to provide interest at 6 per cent. for those advances, there must be secured at the succession of B to A, and also by assurance at the death of B if first, the sum of £250·39.

4. For the same advance of £100, and of premiums according to the mode of successive yearly assurance, with interest at 6 per cent., there must be secured £248·40.

5. To cover an advance of £100 with interest at 6 per cent. without reassurance, there must be secured at B's succession to A the sum of £247·52.

The second question proposed to Mr. Sang is as follows:—

B, aged 30, wishes to borrow £100, to be repaid on his succession to A, aged 58, to whom he is heir of entail. In this case the office deem it proper to reassure on B's death, whether that event may happen before or after A's, in order that they may secure themselves out of the rents, should B be unable to pay the money down. Required the amount to be secured, and also an opinion as to the vesting of the policy of assurance should B pay up the stipulated sum.

OPINION.

In this question it is assumed that B being only heir of entail, and therefore life-renter of the property, may at the time of his succession be unable to pay the stipulated sum. Besides the reassurance at the death of B, if it should happen before A's, the lender requires an assurance at B's death, should it happen after he has succeeded to the property. The money may thereafter be regarded as lent to B by way of redeemable annuity, he paying the interest of the money and the premium for assurance.

Before any computation can be gone into, it must first be clearly understood what party is entitled to the policy when the money has been repaid. Up to the date of B's succession to the property, the policy is clearly for the benefit of the lender. To bring out the points of the case, let us suppose that B succeeds to the property, pays the whole sum, and shortly after dies. The lender, if the policy belong to him, would then receive the money twice over, and would seem to be overpaid. The injustice is however only apparent, its reality depending entirely on the nature of the original agreement. Nay, it may happen, should the succession be long of opening, that the lender, having paid a great number of premiums, loses by the reassurance. The best way of examining the subject is to consider separately two cases; the one, in which it is agreed that the policy of assurance is to remain the property of the lender; the other, in which the policy is to be assigned to B whenever he repays the money.

Case 1.—B, heir of entail to A, wishes to borrow £100, to be repaid at his succession to the property, the policy of assurance however remaining the property of the lender after redemption. Required what sum must be secured.

For convenience, let us first compute what present advance must be made for £1 so secured.

In this case the lender agrees to purchase the reversion of £1 at the succession of B to A, but from the imperfect nature of the security, only on condition that B procure and assign a policy of assurance at his death, the lender making his valuations at 6 per cent.

The 3 per cent. premium for this assurance is ·01981; and the lender having to disburse this as it falls due, estimates its present value at ·27773, obtained by multiplying the actual premium by the 6 per cent. value of an annuity during the life of B. In return for this the lender has the expectation of £1, to be paid at the death of B, which expectation, valued at 6 per cent., is worth ·21252. According to the lender's calculation, therefore, he has a loss on this transaction of ·06521.

The 6 per cent. value of £1 due at the succession of B to A is ·40401, which value B is to receive, subject however to the deduction of the above loss. The balance is thus ·33880.

Hence for £100 of present advance there must be secured at B's succession, and also at B's death, the sum of £295·16, the lender paying the annual premium £5·847 during the life of B, and drawing the sum assured at his death.

If at the death of A, B discharge his obligation, the lender may dispose of the policy, or may keep it up, as he may be inclined. Should B not discharge the debt, but offer to pay in lieu a redeemable annuity, the existing policy may be made available, but still on the distinct ground that it is the property of the lender. The manner of effecting this is of course open to arrangement between the parties. Two courses present themselves :—

1st. B may pay annually the interest of the £295·16, together with the premium for assurance, at his then age, to the lender, out of which premium the smaller premium charged by the office may be taken, leaving the difference of the premiums as payment to the lender for the value of the policy : by this arrangement the lender would claim the proceeds of the policy at the death of B ; while if B should redeem the original bond, he would need also to compound for this difference of premiums, and so obtain the policy for himself.

2ndly. B may at his succession purchase the policy at its then value, continue the payment of the premium with interest by way of redeemable annuity, assigning the policy to the lender in security.

3rdly. B may augment his debt by the value of the policy, and pay interest for the debt so augmented, together with the premium ; but this arrangement would require the opening of a new policy for the augmentation of the debt, and could only be gone into if the borrower were in good health at the time.

Case 2.—B, heir of entail to A, wishes to borrow £100, to be repaid at his succession to the property, to be additionally secured by a policy of assurance, which policy is to become the property of B after redemption ; and in case that the obligation be not redeemed at the date of the succession, the borrower is to continue the payment of the premium with interest until redemption, the policy remaining with the lender in security until then.

In this case the lender is secured in the repayment of the principal sum at the occurrence of the first death of A or B ; the arrangement for a redeemable annuity after the succession being equivalent to payment of the principal sum on that event. But the policy of assurance conveys more than that expectation ; the value of the additional security thereby afforded falling to be handed over to B at A's death, and the borrower being thus enabled, out of the rents of the property, to secure his personal representatives from the repayment of the advance. The terms must, of course, be proportionably higher.

The expectation of £1 at the first death of A or B, computed at 6 per cent., is worth ·50280, while the present value of the premium, payable during the joint life, is ·17906, leaving to B a balance of ·32374.

At this rate, for a present advance of £100, there will need to be secured the principal sum of £308·89: but then the lender is bound to pay an annual premium of £6·119 during B's life until his succession to A, and then to hand over to B the policy thus expensively kept up, which policy may, if the succession open late, be of very considerable value.

The difference between the results brought out in the last two cases, shows the propriety of having the destiny of the policy of reassurance clearly laid down in the contract, and of having the computations made according to the very conditions therein contained.

(To be concluded in our next Number.)

On the Determination and Division of Surplus, and on the Modes of returning it to the Contributors.

[Concluded from No. 2.]

HAVING, in our preceding Number, endeavoured to lay down what appears to us to be a correct method of procedure with reference to the determination and division of surplus, we now proceed to consider the modes usually adopted for the return of it to the contributors. Of these we believe the following to be the principal ones practised at the present day:—

1. The share of surplus is returned by way of reduction in the premium next payable.
2. By way of reduction in the t next premiums payable.
3. By way of reduction in all the future premiums.
4. In augmentation of the sum assured.
5. In augmentation of the sum assured, but at a certain rate per cent. per annum thereon.
6. In any one of these ways, but subject to the assured having

previously paid in premiums and interest a sum equal to the amount guaranteed by his policy.

7. In augmentation of the sum assured, but the amount added being subject to reduction, as well as increase, after future valuations.

8. In augmentation of the claims accruing in the interval since the preceding valuation.

When the surplus is returned in reduction of the premium next payable, it is usually in the shape of a per-centage upon the premium; that is to say, each premium is reduced in the proportion which the sum of the premiums annually payable in respect of participating assurances bears to that which is to be divided; so that if we call the former $\int . p$, the latter S, and any given premium p, then the amount allowed in reduction of it will be $\frac{S}{\int . p} \times p$. But we have shown, in our preceding Number, that the share of each member should be $\frac{S}{\int . \phi a^n} \times \phi a^n$ when the interval between the valuations is considerable. When it does not exceed a year, which is almost always the case where the surplus is allotted in the manner under consideration, the operation of interest may perhaps be safely disregarded, and the above expression then becomes $\frac{S}{\int . \phi} \times \phi$; which is identical in value with $\frac{S}{\int . p} \times p$ when ϕ is a per-centage upon p, but not otherwise. Whenever, therefore, the premiums charged are not made up of the true premium increased by a per-centage upon it, the mode of distributing the surplus here alluded to is inequitable, the true one being in accordance with the expression $\frac{S}{\int . \phi} \times \phi$; in other words, the true premium should be omitted altogether from the calculation.

The allotment of the surplus in reduction of a certain number of premiums to be paid thereafter, requires but a simple process. The divisor for each share will of course be the value of a temporary annuity at the given age, for the given term. It will be necessary, however, to have regard to the time of the premium next payable falling due; and hence the divisor will vary from

$1 + A^{t-1}$ to A^t. To facilitate the operation, a table may be formed of these values, exhibiting monthly differences, calculated of course at the true rates of mortality and interest.

The same process will have to be followed when all the future premiums are to be reduced, the value of the annuity for the whole term of life being substituted for the temporary one.

The application of the share of surplus in augmentation of the sum assured is attended with no more trouble. Here the divisor will evidently be the single premium for £1, at the true rates, corresponding with the age at the time of the valuation; for where no option is given, it is scarcely necessary to guard against depreciation in lives, which will obviously be of much the same character as those represented in the tables. If an option be given, then it is to be expected that those who are conscious of possessing a vigorous constitution will select the one alternative, whilst those who are in an ailing condition will choose the other. The mean duration of the lives on which the reversions are taken may be slightly diminished by this, and therefore some addition to the real age may fairly be made in such cases. Probably an average one of three years would be more than sufficient for the purpose; for a little consideration will show that the influence which can be thus exerted is very small. As we have said, the addition should be an average one, that is to say, a certain proportion of the expectation in each case, not the same number of years at all ages.

The next method alluded to, viz. the augmentation of the sum assured at a certain rate per cent. per annum, demands more extended consideration. The most remarkable feature in it is, that it entirely disregards the age of the person at whose decease the sum added is to be payable, the only elements taken into account being the amount assured and the duration of the policy. We believe the process is somewhat as follows:—The value of an arbitrary addition, say of £1 per cent. for each year since the date of each assurance is first determined, and a comparison of the sum of these values with the sum to be divided, then affords the means of arriving at the actual addition which this last will suffice for. Hence the relation between the surplus and the total amount added to the assurances may be truly represented; but the proper correspondence between them in each individual case is wholly destroyed. For let us suppose that two persons become members of a society thus dividing, one at 25 years of age and the other at 35; the former will pay, according to the Northampton Table, £2 8*s*. 1*d*. for each £100, and the latter £2 19*s*. 10*d*. Now we believe it will be acknowledged that the Carlisle Table represents pretty nearly the rate of mortality usually prevailing in assurance societies; and we will assume, first, that 3 per cent. is the true rate of interest. After ten years have elapsed, each of the assured receives the same reversionary bonus, the relative *immediate* benefit being in this case as the numbers ·434 and ·509. But the premium *for the risk* in the one case is £1 14*s*. 3*d*., and in the other £2 4*s*. 8*d*. In ten years, then, with interest, one has overpaid 8·15 and the other 8·94, and these numbers represent the rates at which they should be recouped; but the relation between these is as ·434 to ·476, not ·434 to ·509; and hence, on this hypothesis, the older life gets more than his share.

If we assume 4 per cent. to be the true rate of interest, then the same bonuses allotted to each at the end of ten years will be relatively worth ·345 and ·419, whilst the contribution to the surplus made by each will be as the numbers ·345 and ·377, making matters rather worse than before. And so, let us take what instances we may, we believe it will be found that in none of them does the recipient under this system get the proportion of surplus to which he is properly entitled. It is one, in short, in which the exact adjustment of *individual* rights is entirely sacrificed, for the sake of an arrangement, which, while it is easily intelligible and therefore popular, economises no inconsiderable quantity of labour.

It is proper to mention, however, that there are certain concomitants, in conjunction with which this system presents itself in a less objectionable shape than with others. Thus it seems to adapt itself, although rudely, to the circumstances of an office in which the premiums are made up of the true premium increased by a per-centage; for with such rates, in any given interval, the older the life at its commencement, the more he will have contributed at its termination towards the surplus; whilst the bonus additions for such interval being in each case the same, will also be more valuable in proportion to the increased age of the life; and thus the contribution and the benefit will in some sort correspond. Where the premiums payable are not thus made up, as in the instance of those formed from the Northampton Table, the operation of this system is obviously inequitable. As compared with almost any true table, the additions for extra contingencies in this very commonly adopted rate are either constant, or have a tendency to decrease as the age increases; so that in equal times the contributions to surplus made by the assured are either the same in each case, or diminish as the age of each contributor is greater. But, as we have seen, the value of the reversionary additions is always greater the older the life of the assured, and the additions are thus always at variance with, and sometimes exactly the reverse of, what they ought to be.

We now come to the plan which restricts the allowance of any bonus to such only of the assured as have paid in premiums and interest a sum equal to the amount guaranteed by their policies. In this arrangement, the assured in fact agree to forfeit whatever surplus may have accrued in respect of their assurances, in the event of their dying before a certain period has elapsed; what that period is, is not, so far as we have observed, very clearly defined, for no particular rate of interest at which the premiums are to accumulate is stipulated for. No doubt it will be the same in every case; but that will not make the arrangement either reasonable or equitable. Unless the premiums are no more than sufficient for the risk and actual expenses, in which case there will be no surplus at all to divide, all will pay somewhat too much; and as the lives of some of those who die within the period stipulated for will extend further into it than others, some will forfeit more than others. The intention of the founders of this scheme was no doubt a good one; but in seeking to equalize the advantages to be derived from the ordinary systems of assurance, they have lost sight of the fact, that the true limit of the essential inequalities of any of its systems is the bare value of the risk, taken during small and, for convenience sake, equal intervals of time, as determined by the theories upon which the whole superstructure is raised. In each of the methods we have previously adverted to, it will be observed that clear way is left for a continual approximation to this limit; but in the one under consideration, an artificial barrier is created, which stands in the way of such approximation, and which only ceases to operate when it is too late to remedy the injustice of which it has been the cause.

The next arrangement we have to consider is that in accordance with which the amount added to the sum assured as a bonus may be reduced at subsequent valuations, should a change of circumstances require it. This is practically a harmless provision, since it is extremely unlikely ever to come into operation in a well-conducted society. It will readily be seen, that so long as there is any surplus at all in respect of a given interval terminated, the restriction will be inoperative, inasmuch as the previous additions will not be affected. Supposing them to have been prudently allotted and a sufficient reserve made for expenses, nothing can touch them, not even a decline in the numbers, unless indeed a very inferior class of lives were admitted to make up for such decline. But this is an occurrence to the last degree improbable, since the carrying it out would be against the interest of all the original members. The provision was no doubt introduced as a sort of safety-valve; but its advantages can hardly be considered sufficient to counterbalance the unpopularity with which it must to a certain extent be attended. To the public mind it probably presents a contingency of a formidable character; it is a few only who understand its insignificance.

The last mode we have to record is that by which the surplus of any given year is divided amongst the representatives of those who die in that year. Our readers will probably be as much at a loss as ourselves to discover any good grounds for such an extraordinary provision. It is said to be defended on the principle that copartnership terminates with death, and that the retiring partners are entitled to such profits as exist at the time of their retirement. Why the share of those who remain in the partnership, and who have all more or less contributed to the profits, is not at least reserved, if not distributed, till they in their turn make their exeunt, we do not understand, and we believe it would be quite fruitless to inquire.

Such then are the various methods employed for the purposes in question; as regards the actual determination of the values of the several quantities required, but a very simple series of operations is necessary. Thus, commencing again with the logarithm of the real share of surplus, which it will be remembered is identical with what is called a "cash bonus," or the return to be made when it is to be applied in reduction of the next premium payable, the process will be nearly as follows:—

Log. real share of surplus . . . . £ ,, ,, ,, ...
Log. A_x^t . . . .
Log. amount of reduction for *t* years . £ ,, ,, ,, ...
Log. A_x . . . .

Log. amount of reduction in all future premiums . . . . } £ „ „ „ . . . . .

Log. V_x . . . .

Log. amount of reversionary addition . £ „ „ „ . . . . .

The values of A_x^t and A_x must of course be taken out with reference to the time the next premium falls due; and where the option before alluded to is given, the value of V_x must be increased so as to correspond with the expression $V_{x+\frac{e}{n}}$, e being the expectation at age x. In all these cases it is obviously desirable to be prepared beforehand with tables of the quantities brought into play, and of the logarithms of such quantities.

The natural numbers then being found which answer to the several logarithmic ones obtained as above indicated, all that remains to be done is to tabulate them in the order pointed out at a previous page of this article, and the work is complete.

Before we conclude, however, we would say a few words on what we have so frequently adverted to in these pages as the "true premium." It has been objected to the method herein laid down, and urged in favour of the one hitherto most commonly practised, that there is no such thing as a true premium, inasmuch as the elements which constitute it are always varying, are different under different circumstances, and are exceedingly difficult to arrive at even at the best; a little consideration will show that these objections have no weight. It is not pretended that the true premium, or the premium for the risk, can be assigned with perfect accuracy in any given case. What is insisted upon is, that a distinction must always be drawn between it and the premium charged. At the outset, the one is well understood to be, and is sometimes even advisedly made more than the other; and to treat them thereafter as though they were identical, is nothing less than what Bishop Berkeley would call "a shifting of the hypothesis," a proceeding which can scarcely ever fail to lead to erroneous conclusions. Our inability to determine the exact difference between the two may lay us open to errors; but so long as some distinction is maintained, the results we shall arrive at will always be nearer the truth than those obtained from operations in which the distinguishing qualities of the two charges are lost sight of, and the one altogether confounded with the other.

On the Rates of Premium to be charged for Assurances on the Lives of Military Officers serving in Bengal. By CHARLES JELLICOE, *Esq., one of the Vice-Presidents of the Institute of Actuaries, and Actuary to the Eagle Insurance Company.*

[Read before the Institute of Actuaries, 25th of February, 1851.]

THAT the mean duration of life amongst the indigenous inhabitants of one part of the globe differs more or less from that which obtains amongst those of other parts, there is every reason to believe. It is probable that a difference exists even when comparing the most civilized nations of Europe one with another; and still more may we look for discrepancies when we carry our investigations amongst the natives of more remote and less civilized lands.

The climate, extent of cultivation, modes of life, state of public morals, each and all of them have a tendency to affect the longevity of the human race, and will not fail to make their influence felt in proportion as their good or evil energies are called into existence.

But materially as this inquiry concerns the interests of the life assurance companies of this country, it is almost of little importance when compared with that which has to do with the determination of the mean duration of life amongst our own migratory or emigrant population. For one foreigner whose life is insured in this country, there are probably thousands of our own countrymen resident abroad who are so circumstanced; and tempted as the latter are to leave the mother-country, not only by their own restless and migratory habits, but by the lucrative employments afforded by our numerous colonial possessions, it is likely that some such proportion will still prevail for many years to come.

To arrive, however, at anything like an accurate solution of this problem, even when the contingencies are confined within comparatively narrow limits, is by no means an easy task; and were it not for circumstances of an accidental character, would be all but impossible till the data arising from the experience of the offices themselves should be forthcoming; but it fortunately happens, that in one or two instances, and those of more than ordinary importance, the regulations attendant upon the emigration go far to supply the means of arriving at least at an approximation to the truth. This is more particularly the case as regards our countrymen proceeding to India, either in a civil or military capacity; the records of the East India Company containing more or less all the particulars with reference to them which an assurance office would register for the purpose in question. These records, although inaccessible to the public generally, have been rendered available, in the first instance by Messrs. Dodwell and Miles, and more recently by Mr. Neison in his elaborate Report upon the Bengal Military Fund. The work of Messrs. Dodwell and Miles was published about the year 1838, and contains an alphabetical list of the officers of the Indian army, with the dates of their respective promotion, retirement, resignation or death, whether in India or Europe, from the year 1760 to the year 1834. It was on this that Mr. Woolhouse founded his well-known estimate of the law of mortality in the Indian army; and he speaks of the publication as bearing evidence of great care and accuracy.

Mr. Neison's Report was published in 1849*. Having been called upon to investigate the condition of the Bengal Military Fund, he, in the course of his preliminary inquiries, saw, as he states, reason to doubt the sufficiency of the data as collected by Messrs. Dodwell and Miles; and, moreover, *found it impossible to trace the connexion between the data and the tables constructed from them by Mr. Woolhouse and Mr. Davies.* He accordingly made application at the India House for abstracts from the original records, and was ultimately permitted to make them himself. From these documents he obtained with vast labour the date of the appointment of each cadet, and his age at that date, verified by a certificate of birth; the date of his retirement, resignation, dismissal or death; of his being invalided, pensioned, cashiered or struck off. After a minute and careful comparison of the facts, Mr. Neison was led to confine his observations to the appointments subsequent to the year 1799. He adduces strong evidence to show that "a gradual and important improvement has taken place in the duration of life among the officers in India, even during the present century," arising, it may be presumed, from improved habits of life, a change in the nature and character of the military duties required, or a better knowledge of the climate and the sanitary precautions necessary in it.

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* It is much to be regretted that this Report, as well as that by Mr. Griffith Davies on the same subject, is not more widely circulated. The investigations in both are highly instructive and interesting, not only as regards their object, but the manner in which they are conducted.

There can be no doubt that the experience is thus rendered more suitable to our time. But the rejection of all the cases prior to 1800 reduces the numbers inconveniently, and of course renders the drawing any useful deduction from a comparison with the observations of Messrs. Dodwell and Miles out of the question. Neither is there any means of testing the accuracy of the results obtained from the observations; but any doubt on this head will probably be removed shortly by Mr. Neison himself, who intimates his intention of publishing the results of his laborious investigation in a separate form.

Limiting, then, his inquiry to the appointments which took place between the 1st of January 1800 and the 31st of December 1847, Mr. Neison gives two tables, from which to deduce the prevailing rate of mortality. In Table I. the observations cease on retirement, resignation, invaliding, being pensioned and being dismissed, *and assuming that a return to Europe is consequent upon each of these events*, this table will evidently yield premiums proper to be charged only during residence in India. In Table IX. the observations are extended over the whole duration of the lives, whether they retire from the service or not, expelled officers only ceasing to be taken account of; and as the number of these is not great, this table will give premiums to be charged during the whole term of life, whether the lives remain in Bengal or return to Europe. In many respects an arrangement of this kind would be much more convenient; but the expectation of a reduction of charge on return to Europe has become so general, that on account of it, and for other reasons, Table I. is better adapted to the purposes of an assurance office. It is to be observed, however, that in neither case would any reduction during residence at home on furlough be justifiable.

Mr. Neison has himself constructed a table of mortality from the data in Table IX., his objects requiring such an one. I propose in the present paper to deduce premiums from the data in Table I., taking for a basis the figures in the last column of it, that is to say, the mortality per cent. as obtained from actual observation.

I believe that almost all the writers who have adverted to the subject, acknowledge the necessity, or at least the paramount convenience, of introducing a certain degree of regularity into mortality tables greater than is usually exhibited by the facts as simply recorded. Mr. De Morgan, indeed, hints a dislike of the practice, and seems to advocate the correction of the monetary tables, and other similar results, rather than the adjustment of the mortality table in its first stage. Such a mode of proceeding, however, presents so many and such serious inconveniences, that it is hardly likely to be adopted by practical people; and it seems the less to be called for, since the requisite uniformity may be given to the rude results without seriously distorting their proper features. A more crying evil is the insufficiency which so often prevails with regard to the extent of the observations themselves. No one can examine the figures which constitute the basis of the calculations under consideration without coming to the conclusion, that they would have exhibited a very different aspect had the numbers observed upon been greater. Nevertheless, in the absence of more complete records, we can but be guided by those within our reach.

Of the various methods adopted for the construction of mortality tables, there are none, as it appears to me, better than those pointed out by Mr. Farren in his work on Life-Contingency Tables, just published. They have the advantages, heretofore very generally wanting, of consistency and exactness, and leave little or nothing for the arbitrary adjustment of individual computers. In the present case I have selected Mr. Gompertz's method of graduation for the interval between 24 and 64 years of age, as more suitable and less laborious than the interpolation by finite differences. Following Mr. Farren's arrangement, I have first determined the number of survivors which would remain at the ages 34, 44, 54 and 64, supposing the number living at 24 to be subjected to the force of mortality which actually prevailed. I have then determined the numbers living at the intervening ages by Mr. Gompertz's well-known formula $L_x = d \,.\, g^{q^x}$, changing the constants once only throughout the series. By this process the number of survivors at the above-mentioned decennial epochs remain as at first, whilst the hypothetical principle is fully maintained which stipulates for a rate of mortality increasing in intensity as the age increases; a condition, which, as Mr. Galloway justly observes, "one can scarcely help thinking ought to be fulfilled." The formula and constants used for the number living at any age from 24 to 44 are thus

$$\lambda L_x = 5 \cdot 01962 - N, \text{ where } \lambda N = [\bar{1} \cdot 9241453 + x \cdot 0044078],$$

and for the number living at any age from 44 to 64,

$$\lambda L_x = 4{\cdot}53789 - N, \text{ where } \lambda N = [\bar{1}{\cdot}5983634 + x{\cdot}0072977].$$

After the age of 64, Mr. Neison's facts fail; and seeing no better course, I have been fain to adopt a termination to the table corresponding with that given by Mr. Woolhouse, finding no sufficient reason for a greater prolongation of it than he has given, and taking into account that the abruptness of its termination renders the table practically a safer one. In the interval, and as a means of transition, I have adopted the rate given by Mr. Neison in the mortality table derived by him from the data in Table IX. All this will be rendered more apparent by inspection of the diagram appended to this paper. In it is described the curve of mortality per cent. as adjusted by Mr. Woolhouse, the unadjusted one corresponding with Mr. Neison's data, and that now deduced from such data, and coinciding at its close with the curve laid down by Mr. Woolhouse. The diagram also serves to show the direction given to the adjusted curve between the ages 18 and 24.

I have been careful to state these details minutely, lest any obscurity in them should give rise to a want of confidence on that score in the results, and also that any such want, should it arise, may be the more readily traced to its source.

With the aid, then, of the table thus constructed, I have deduced the annual premiums at 4 per cent. for the whole term of life; and, as will be seen, I have also deduced those to be derived from Mr. Woolhouse's table. It will be observed that the difference between them is very considerable, the latter being on the average about 21 per cent. in excess of the former up to the age of 65. This is the more remarkable, inasmuch as Mr. Woolhouse expressly states that he commenced an investigation into the mortality which had prevailed *since the beginning of the year* 1800, and discontinued it because he soon perceived that it would be merely a close verification of that derived from the whole experience; and he was led to conclude from that circumstance, that there was no great fluctuation in the rate, even throughout a long period. On the other hand, it must be remembered, that Mr. Neison's returns come down to the end of 1847, just ten years and three months later than those used by Mr. Woolhouse. But allowing the full effect to this admixture of more recent experience, the two statements would seem to be scarcely reconcileable.

Under these circumstances, the wiser course would appear to be, to adhere, for the present at least, to the table constructed by Mr. Woolhouse, ratified as it has been by Mr. Griffith Davies*. Should Mr. Neison, with the liberality for which he is distinguished, give publicity to the valuable data he has collected, the offices will be better able to judge of the expediency of adopting them; and in the meantime they have the satisfaction of learning that they tend fully to confirm the safety at least of their present course. This is so material a consideration, that it necessarily overrules every other, and leads at once, where any room is left for doubt, to the selection of that alternative which carries with it the greater degree of security.

Whilst advocating, however, an adherence to the basis afforded by Mr. Woolhouse's table, I would stipulate for a rather important modification of the manner of forming the actual premiums from it. In a former paper I had occasion to remark upon what I conceive to be the improper mode usually adopted of "loading" the true or net premiums; now nothing can show in a more forcible manner the inexpediency of the mode of addition by way of a per-centage, than the consequences which result from it, when the "unloaded" premiums are themselves, from the nature of the case, more than ordinarily high. When this occurs, the addition of only a moderate per-centage raises the rate, towards the later periods of life, quite unreasonably, and makes the sum demanded for expenses, &c. altogether preposterous; as I have before observed, there is no one object for which the payments, over and above those for the risk, are required, which is not of periodical recurrence, that is to say, expenses are incurred, interest is paid, profits are divided, and surplus is returned, at the expiration of certain intervals; and therefore the provision for these should be made by an equal contribution during those intervals from each of the assured *in a given sum* (for it would stretch the principle rather far to omit this last element). It is true, that if the returns, by way of bonus to the assured, are made on the correct principle, they will get back sums in proportion to those they have severally paid; but there is no good reason why one should be called upon even to advance during the same period more than another for these objects, unless it be the being assured for a larger amount. All this, of course, supposes that the *premium for the risk* is assumed correctly in the first instance, and that the risk itself remains invariable; and although this may not be strictly true, it is probable that the actual variation is not great during short periods, whilst suitable corrections can be applied at intervals if necessary. This arrangement appears to meet the requirements of the case with sufficient accuracy and with great simplicity. If more be demanded, recourse must be had to those more complicate and recondite considerations which the higher analysis is alone competent to deal with.

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* If the facts, as given by Messrs. Dodwell and Miles, could be checked with those in Mr. Neison's possession, the chain of evidence would be unbroken; and it would be, of course, competent for any one to satisfy himself of the correctness of the deductions from them.

Applying then this principle, I have increased the rates yielded by Mr. Woolhouse's table by additions, averaging 25 per cent., at all ages from 18 to 65; so that each person assured for £100 pays the like contribution of £1 6*s.* per annum towards extra contingencies; and to the premium so increased I have also added a provision for payment of the usual commission. The rates thus formed will be found lower than those usually demanded. Nevertheless I would submit, that they constitute a reasonable and equitable scale under the circumstances of the case.

It now only remains briefly to consider the best course to be pursued when persons who have been assured for some time in Europe are about to proceed to India, and *vice versâ*, and are desirous notwithstanding that the assurances on their lives should still remain in force. A little reflection serves to show that the two contracts are so dissimilar in their nature, that scarcely any arrangement can satisfactorily reconcile them. This is particularly the case where the assurance in question has a bonus attached to it. The change from Europe to India *ipso facto* evidently augments the value of such an addition considerably, whilst practically it would be difficult for the assurers to obtain proper compensation for such increased value. The most simple and direct mode of meeting the contingency, appears to me to be to consider the first contract as determined, and to make allowance in the new one for whatever advantage has accrued to the assured on the score of the old; that is to say, the premium for India being taken in correspondence with the age, at the time of departure is to be diminished by that equivalent to the value of the original policy; so that if p and A denote the Indian rate of premium and annuity, and v the full value of the policy, the new rate to be paid will be $p - \frac{v}{1+A}$, the assurance being thenceforth treated in official calculations as one originating at the time of departure. There is no need to cancel the original policy, the new rate can of course be endorsed upon it, but the allotment of bonus, if there be any, must be recalled.

Precisely the same process would have to be gone through on a return from India to Europe, except that the rate of premium and annuity to be taken in the calculation would be the European ones; and also that it would be desirable, as a matter of precaution, to make an addition to the actual age at the time of return, to compensate for the deterioration caused by the previous foreign residence. From what Mr. Christie and Mr. Neison have shown, it would appear that three years would be more than sufficient for this purpose; and as such an addition would tell with greater effect the greater the age of the individual, it would apparently be not ill adapted to meet the contingency in question. As I have said, these methods appear to me to be the most direct and simple, but no doubt some difficulties would attend them in practice. Very little however has been written on the subject hitherto; and imperfect and unsatisfactory as the practice in reference to it at the present day must be acknowledged to be, the mere attracting attention to it will not, in all probability, be unproductive of advantage.

Irregular Ratios.

Age.	Mortality per cent. by Mr. Neison's Table.	p_x.	Log p_x.	Log l_x.
18	1·506	·984940	$\bar{1}$·9934098	·0000000
19	1·773	·982269	·9922305	·9934098
20	1·955	·980454	·9914273	·9856403
21	1·890	·981104	·9917151	·9770676
22	2·324	·976764	·9897897	·9687827
23	2·345	·976549	·9896941	·9585724
24	2·668	·973323	·9882570	*·9482665*
25	2·457	·975434	·9891979	·9365235
26	2·554	·974461	·9887645	·9257214
27	2·077	·979235	·9908869	·9144859
28	2·253	·977466	·9901016	·9053728
29	2·967	·970335	·9869217	·8954744
30	2·724	·972758	·9880048	·8823961
31	2·593	·974069	·9885898	·8704009
32	2·644	·973565	·9883650	·8589907
33	3·068	·969323	·9864686	·8473557
34	2·777	·972229	·9877686	*·8338243*
35	2·850	·971502	·9874437	·8215929
36	3·260	·967403	·9856075	·8090366
37	2·704	·972965	·9880972	·7946441
38	3·064	·969361	·9864856	·7827413
39	2·573	·974267	·9886780	·7692269
40	2·587	·974128	·9886160	·7579049
41	3·803	·961971	·9831620	·7465209
42	2·363	·976366	·9896126	·7296829
43	2·756	·972437	·9878615	·7192955
44	2·893	·971069	·9872501	*·7071570*
45	2·839	·971611	·9874924	·6944071
46	2·796	·972040	·9876841	·6818995
47	3·903	·960967	·9827085	·6695836
48	3·766	·962343	·9833299	·6522921
49	4·508	·954923	·9799684	·6356220
50	4·468	·955322	·9801498	·6155904
51	4·118	·958824	·9817389	·5957402
52	2·913	·970874	·9871629	·5774791
53	2·162	·978379	·9905072	·5646420
54	2·751	·972495	·9878874	*·5551492*
55	2·637	·973627	·9883926	·5430366
56	2·985	·970149	·9868385	·5314292
57	5·085	·949153	·9773363	·5182677
58	5·448	·945525	·9756730	·4956040
59	3·922	·960784	·9826258	·4712770
60	3·659	·963415	·9838134	·4539028
61	1·695	·983051	·9925760	·4377162
62	4·545	·954546	·9797969	·4302922
63	7·692	·923077	·9652379	·4100891
64	6·250	·937500	$\bar{1}$·9719713	*·3753270*

Graduated Ratios.

Log l_x.	Log p_x.	p_x.	Mortality per cent.	Age.
·01066	$\bar{1}$·99008	·97742	2·258	18
·00074	·98986	·97692	2·308	19
·99060	·98966	·97647	2·353	20
·98026	·98948	·97607	2·393	21
·96974	·98933	·97572	2·428	22
·95907	·98919	·97542	2·458	23
·94826	·98907	·97515	2·485	24
·93733	·98897	·97492	2·508	25
·92630	·98885	·97465	2·535	26
·91515	·98873	·97438	2·562	27
·90388	·98862	·97414	2·586	28
·89250	·98850	·97387	2·613	29
·88100	·98839	·97362	2·638	30
·86939	·98826	·97333	2·667	31
·85765	·98815	·97308	2·692	32
·84580	·98802	·97279	2·721	33
·83382	·98791	·97254	2·766	34
·82173	·98778	·97225	2·775	35
·80951	·98765	·97196	2·804	36
·79716	·98753	·97170	2·830	37
·78469	·98740	·97141	2·859	38
·77209	·98728	·97113	2·887	39
·75937	·98714	·97082	2·918	40
·74651	·98702	·97055	2·945	41
·73353	·98687	·97022	2·978	42
·72040	·98675	·96995	3·005	43
·70715	·98593	·96812	3·188	44
·69308	·98569	·96758	3·242	45
·67877	·98544	·96703	3·297	46
·66421	·98519	·96647	3·353	47
·64940	·98495	·96593	3·407	48
·63435	·98469	·96536	3·464	49
·61904	·98442	·96476	3·524	50
·60346	·98417	·96421	3·579	51
·58763	·98390	·96360	3·640	52
·57153	·98362	·96298	3·702	53
·55515	·98335	·96238	3·762	54
·53850	·98306	·96174	3·826	55
·52156	·98278	·96112	3·888	56
·50434	·98249	·96048	3·952	57
·48683	·98219	·95983	4·017	58
·46902	·98187	·95912	4·088	59
·45089	·98159	·95849	4·151	60
·43248	·98127	·95778	4·222	61
·41375	·98095	·95708	4·292	62
·39470	·98063	·95637	4·363	63
·37533	$\bar{1}$·98014	·95530	4·470	64

Graduated Ratios (continued).

Age.	Log l_x.	Log p_x.	p_x.	Mortality per cent.	Mortality per cent. by Mr. Neison's Table.
65	·35547	$\bar{1}$·97914	·95311	4·689	4·692
66	·33461	·97755	·94961	5·039	5·039
67	·31216	·97576	·94572	5·428	5·428
68	·28792	·97378	·94141	5·859	5·859
69	·26170	·97160	·93670	6·330	6·330
70	·23330	·96922	·93157	6·843	6·843
71	·20252	·96663	·92603	7·397	7·397
72	·16915	·96371	·91984	8·016	8·016
73	·13286	·96048	·91301	8·699	8·699
74	·09334	·95691	·90554	9·446	9·446
75	·05025	·95299	·89741	10·259	10·259
76	·00324	·94873	·88865	11·135	11·135
77	·95197	·94414	·87930	12·070	12·070
78	·89611	·93921	·86938	13·062	13·062
79	·83532	·93393	·85888	14·112	14·112
80	·76925	·92829	·84780	15·220	15·220
81	·69754	·92480	·84100	16·385	16·385
82	·62234	·90379	·80128	19·872	17·620
83	·52613	·85898	·72273	27·727	18·924
84	·38511	·74008	·54964	45·036	20·298
85	·12519	$\bar{1}$·00000	·00000	100·000	21·740

Bengal Military Mortality, 4 *per cent*. (*From* Mr. Neison's *data*

Age.	L_x.	D.	N.	Annuity.	Annual premium.
18	10248	5058·700	72309·9012	14·294	2·692
19	10017	4754·488	67555·4132	14·209	2·729
20	9786	4466·202	63089·2112	14·126	2·766
21	9556	4193·498	58895·7132	14·044	2·801
22	9327	3935·574	54960·1392	13·965	2·836
23	9101	3692·513	51267·6262	13·884	2·872
24	8877	3463·104	47804·5222	13·804	2·909
25	8656	3247·013	44557·5092	13·723	2·945
26	8439	3043·853	41513·6562	13·638	2·985
27	8225	2852·569	38661·0872	13·553	3·025
28	8015	2672·818	35988·2692	13·465	3·066
29	7807	2503·322	33484·9472	13·376	3·110
30	7604	2344·457	31140·4902	13·283	3·155
31	7403	2194·693	28945·7972	13·189	3·201
32	7205	2053·843	26891·9542	13·093	3·249
33	7011	1921·673	24970·2812	12·994	3·300
34	6821	1797·689	23172·5922	12·890	3·353
35	6633	1680·901	21491·6912	12·786	3·408
36	6449	1571·420	19921·2712	12·677	3·465
37	6268	1468·572	18452·6992	12·565	3·525
38	6091	1372·210	17080·4892	12·447	3·590
39	5917	1281·746	15798·7432	12·326	3·657
40	5746	1196·827	14601·9162	12·201	3·729
41	5578	1117·150	13483·7662	12·070	3·805
42	5414	1042·601	12441·1652	11·933	3·886
43	5253	972·687	11468·4782	11·791	3·971
44	5093	906·788	10561·6902	11·647	4·061
45	4933	844·519	9717·1712	11·506	4·150
46	4773	785·703	8931·4682	11·367	4·240
47	4616	730·634	8200·8342	11·224	4·334
48	4461	678·941	7521·8932	11·079	4·433
49	4309	630·583	6891·3102	10·928	4·537
50	4160	585·366	6305·9442	10·773	4·648
51	4013	542·963	5762·9812	10·614	4·764
52	3869	503·344	5259·6372	10·449	4·888
53	3729	466·471	4793·1662	10·275	5·023
54	3591	431·932	4361·2342	10·097	5·165
55	3455	399·591	3961·6432	9·914	5·316
56	3323	369·541	3592·1022	9·721	5·481
57	3194	341·535	3250·5672	9·518	5·662
58	3068	315·442	2935·1252	9·305	5·858
59	2945	291·151	2643·9742	9·081	6·073
60	2824	268·449	2375·5252	8·849	6·307
61	2706	247·339	2128·1862	8·604	6·567
62	2593	227·895	1900·2912	8·338	6·862
63	2481	209·664	1690·6272	8·063	7·187
64	2373	192·825	1497·8022	7·767	7·560
65	2267	177·128	1320·6742	7·456	7·980
66	2161	162·351	1158·3232		
67	2052	148·232	1010·0912		205·126
68	1941	134·821	875·2702		
69	1827	122·021	753·2492		
70	1711	109·878	643·3712		
71	1594	98·428	544·9432		
72	1476	87·636	457·3072		
73	1358	77·529	379·7782		
74	1240	68·070	311·7082		
75	1123	59·276	252·4322		
76	1008	51·160	201·2722		
77	895	43·6769	157·5953		
78	787	36·9291	120·6662		
79	684	30·8621	89·8041		
80	588	25·5097	64·2944		
81	498	20·7745	43·5199		
82	419	16·8065	26·7134		
83	336	12·9592	13·7542		
84	243	9·0116	4·7426		
85	133	4·7426			

Bengal Military Mortality, 4 *per cent.* (Mr. Woolhouse).

Age.	L_x.	D.	N.	Annuity.	Annual premium.	Premiums to be charged.
18	100000	49362·835	668638·910	13·545	3·029	£4 11 1
19	97319	46191·732	622447·178	13·475	3·062	4 11 10
20	94722	43229·910	579217·268	13·399	3·099	4 12 7
21	92201	40460·918	538756·350	13·315	3·140	4 13 6
22	89745	37868·409	500887·941	13·227	3·185	4 14 5
23	87344	35437·790	465450·151	13·134	3·229	4 15 4
24	84994	33158·015	432292·136	13·037	3·278	4 16 4
25	82691	31018·807	401273·329	12·936	3·330	4 17 5
26	80431	29010·627	372262·702	12·832	3·383	4 18 7
27	78212	27125·250	345137·452	12·724	3·440	4 19 10
28	76030	25354·324	319783·128	12·613	3·500	5 1 1
29	73882	23690·393	296092·735	12·498	3·562	5 2 4
30	71766	22126·820	273965·915	12·382	3·627	5 3 8
31	69679	20657·085	253308·830	12·263	3·694	5 5 1
32	67622	19276·218	234032·612	12·141	3·764	5 6 7
33	65594	17978·962	216053·650	12·017	3·836	5 8 1
34	63596	16760·889	199292·761	11·890	3·912	5 9 7
35	61629	15617·768	183674·993	11·761	3·990	5 11 4
36	59691	14544·860	169130·133	11·628	4·073	5 13 1
37	57782	13538·168	155591·965	11·493	4·158	5 14 11
38	55902	12593·935	142998·030	11·355	4·248	5 16 10
39	54050	11708·370	131289·660	11·213	4·342	5 18 9
40	52225	10877·917	120411·743	11·069	4·440	6 0 10
41	50428	10099·637	110312·106	10·922	4·542	6 2 11
42	48657	9370·140	100941·966	10·773	4·648	6 5 3
43	46912	8686·632	92255·334	10·620	4·760	6 7 7
44	45195	8046·826	84208·508	10·465	4·876	6 10 0
45	43507	7448·349	76760·159	10·306	4·999	6 12 7
46	41848	6888·780	69871·379	10·143	5·128	6 15 4
47	40219	6365·986	63505·393	9·976	5·265	6 18 2
48	38621	5877·931	57627·462	9·804	5·410	7 1 3
49	37052	5422·249	52205·213	9·628	5·563	7 4 6
50	35513	4997·143	47208·070	9·447	5·726	7 7 11
51	34062	4600·506	42607·564	9·261	5·900	7 11 7
52	32519	4230·630	38376·934	9·071	6·083	7 15 5
53	31062	3885·652	34491·282	8·877	6·279	7 19 7
54	29629	3563·840	30927·442	8·678	6·487	8 3 11
55	28219	3263 694	27663·748	8·476	6·707	8 8 6
56	26831	2983·812	24679·936	8·271	6·940	8 13 5
57	25466	2723·090	21956·846	8·063	7·188	8 18 8
58	24124	2480·375	19476·471	7·852	7·451	9 4 3
59	22804	2254·477	17221·994	7·639	7·729	9 10 1
60	21507	2044·472	15177·522	7·424	8·025	9 16 4
61	20233	1849·389	13328·133	7·207	8·339	10 2 11
62	18984	1668·486	11659·647	6·988	8·673	10 9 11
63	17760	1500·875	10158·772	6·769	9·026	10 17 4
64	16562	1345·802	8812·970	6·548	9·403	11 5 4
65	15390	1202·468	7610·502	6·329	9·798	11 13 8
66	14246	1070·273	6540·229	6·111		
67	13131	948·563	5591·666	5·895	248·266	£326 19 4
68	12049	836·924	4754·742	5·668		
69	11002	734·807	4019·935	5·471		
70	9991	641·619	3378·316	5·265		
71	9018	556·859	2821·457	5·067		
72	8092	480·461	2340·996	4·872		
73	7224	412 426	1928·570	4·676		
74	6422	352·538	1576·032	4·471		
75	5693	300·499	1275·533	4·245		
76	5038	255·698	1019·835	3·988		
77	4448	217·070	802·765	3·698		
78	3918	183 851	618·914	3·366		
79	3439	155·168	463·746	2·989		
80	3000	130·154	333·592	2·563		
81	2585	107·836	225·756	2·094		
82	2174	87·2024	138·5532	1·589		
83	1742	67·1868	71·3664	1·062		
84	1259	46·6904	24·6760	·528		
85	692	21·6760				

On the Value of Selection as exercised by the Policy-holder against the Company. By JOHN ADAMS HIGHAM, Esq., *Fellow, and Member of the Council of the Institute of Actuaries of Great Britain and Ireland, and Actuary to the Royal Exchange Assurance Corporation.*

[Read before the Institute of Actuaries, 31st of March, 1851.]

DURING the last session of the Institute of Actuaries, I had the honour to read a paper on the Value of the Principle of Selection as exercised by the Offices in granting Assurances upon Lives, and to submit some calculations which I had made with reference to that subject, in which calculations the lives admitted at particular ages were kept apart from others during their subsequent existence. I have now to offer to the Institute an extended set of Tables of a similar character; and, after stating the course which I have followed in constructing them, I shall make a few observations on the value of selection as exercised by the policy-holder against the Company.

The volume which is now lying on the table, and which will at all times be at the service of the members of the Institute, includes the whole *British* experience published by "the seventeen offices," viz. the "Amicable," the "Equitable," and the fifteen who contributed their data to the Committee of Actuaries of 1838. I judged that, on several accounts, the Irish experience would be unsuited to my purpose, and therefore have not made any use of it.

To lessen the labour, which in any case was likely to be sufficiently great, the lives were combined in quinary classes; those who entered at the ages m, $m+1$, $m+2$, $m+3$ and $m+4$ being regarded as though they had all entered at the mean age (which was always taken a multiple of five). Thus, for example, the table headed "mean age at entry, 40 years," includes all the persons who entered at ages 38, 39, 40, 41 and 42. The following table will show that the numbers thus obtained are, for the most part, large enough to prevent material irregularities in the results.

TABLE A.—*Number of Lives observed.*

Assured at (mean) age 5	82
„ „ 10	409
„ „ 15	732
„ „ 20	2,717
„ „ 25	6,593
„ „ 30	9,629
„ „ 35	10,123
„ „ 40	8,606
„ „ 45	6,807
„ „ 50	4,938
„ „ 55	3,209
„ „ 60	1,960
„ „ 65	924
„ „ 70	173
„ „ 75	40
	56,942

The materials having thus been classified, it was a very simple matter to form from them columns of the number exposed to risk in each year of age, and the number who survived the year. From the logs. of these columns, the log. of the probability of living a year was obtained, and thence, by the use of Mr. Peter Gray's Tables, the logs. of the curtate expectations were run up with great facility. The annuities were similarly obtained from a column formed by adding log. *v* to the log. of the probability of living a year.

The following is an abstract of the results:—

TABLE B.—*Complete Expectation of Life* (*unadjusted*).

Age.	Assured at Age											
	20.	25.	30.	35.	40.	45.	50.	55.	60.	65.	70.	75.
20	38·29											
25	34·84	36·33										
30	31·25	32·74	32·54									
35	27·93	29·11	28·74	29·95								
40	25·01	25·72	25·21	26·39	27·73							
45	22·07	22·32	21·59	22·89	23·98	23·54						
50	19·42	19·03	18·09	19·40	20·60	19·95	20·34					
55	16·84	16·37	14·94	16·04	17·37	16·77	17·00	17·06				
60	13·77	14·59	12·23	13·07	14·22	13·65	13·87	13·76	14·54			
65	10·43	11·41	10·17	10·34	11·59	10·71	11·16	10·92	11·36	12·13		
70	5·43	7·50	8·60	7·79	9·24	8·40	8·96	8·82	8·97	9·21	10·00	
75	......	2·50	7·14	5·04	8·06	6·70	7·49	6·74	6·89	7·09	8·11	8·75
80	......	......	4·00	3·70	7·10	4·32	6·05	4·83	5·31	5·99	7·39	6·49
85	......	......	......	......	7·09	3·47	4·32	3·20	4·87	4·50	4·99	3·62
90	......	......	......	......	5·38	......	3·44	......	1·67	3·60		

TABLE C.—*Annuities at 3 per cent. (unadjusted.)*

Age.	Assured at Age											
	20.	25.	30.	35.	40.	45.	50.	55.	60.	65.	70.	75.
20	20·67											
25	19·61	20·30										
30	18·33	19·11	19·13									
35	17·03	17·74	17·66	18·18								
40	15·87	16·36	16·19	16·75	17·26							
45	14·59	14·84	14·46	15·19	15·57	15·47						
50	13·32	13·17	12·61	13·45	13·94	13·69	13·86					
55	12·04	11·80	10·78	11·58	12·22	11·97	12·04	12·16				
60	10·24	11·04	9·10	9·80	10·34	10 12	10·17	10·17	10·69			
65	8·05	9·08	7·75	8·01	8·64	8·19	8·42	8·32	8·63	9·16		
70	4·02	6·23	6·74	6·21	7·00	6·57	6·90	6·90	6·99	7·12	7·64	
75	......	1·91	5·82	4·04	6·17	5·34	5·87	5·38	5·43	5·56	6·31	6·91
80	......	......	3·25	2·96	5·45	3·42	4·81	3·89	4·21	4·73	5·91	5·25
85	......	......	......	......	5·62	2·77	3·44	2·51	3·98	3·59	4·05	2·84
90	......	......	......	......	4·46	......	2·75	......	1·12	2·89		

In considering these tables, it will be borne in mind that they are the results of the rough materials, without any adjustment, or the introduction of any foreign data, except that, in some cases, where persons were left existing at the advanced ages, it was necessary to borrow, from another table, a value for their probable future life-time. It may perhaps be thought that time has been needlessly expended in obtaining these tables from the rough probabilities, seeing that I contemplated an attempt at adjustment. But it was evident that the adjustment must be of so extensive, and in some respects of so arbitrary a character, that it would be necessary, for the satisfaction of the reader, to afford everywhere the opportunity of comparing the adjusted values with the rough values to which they correspond.

In generalising the materials, the first thing to be done was to form a table of probabilities of living a year in respect of mixed lives; in which term I include all the lives, at whatever age assured, among whom, as a body, the effect of selection should appear to have ceased. For example, it may be assumed that persons now aged 75, who were assured at the age of 30, are no better, as a class, than persons, now of the same age, who were assured at the age of 20. As each class would be expected to contain both good and bad in like proportions, they may properly be thrown together in estimating the probability of living a year in respect of mixed lives, and it is necessary that the concluding portions of all the separate tables should be so thrown together, to avoid the irregularities at the older ages occasioned by the small numbers to which the classes have dwindled.

With a view to determine the length of time during which selection continues to exercise an influence, and during which, consequently, the classes must be kept apart, the numbers exposed to risk, and the numbers who survived, were combined for each class in quinary sets, and probabilities of living a year were thence deduced. The following is an example of the resulting table :—

TABLE D.—*Years of risk, ages* 70, 71, 72, 73 *and* 74.

	Number at risk.	Number who survived.	Probability of living a year.
Lives selected at age 20	4	2	·50000
„ „ 25	4 16	2 16	·50000 1·
„ „ 30	20 286	18 260	·90000 ·90908
„ „ 35	306 978	278 912	·90849 ·93250
„ „ 40	1,284 1,604	1,190 1,470	·92679 ·91647
„ „ 45	2,888 2,126	2,660 1,950	·92104 ·91721
„ „ 50	5,014 2,615	4,610 2,402	·91943 ·91854
„ „ 55	7,629 2,855	7,012 2,650	·91912 ·92820
„ „ 60	10,484 3,390	9,662 3,156	·92159 ·93098
„ „ 65	13,874 3,197	12,818 2,981	·92389 ·93244
„ „ 70	17,071 1,252	15,799 1,171	·92549 ·93532
	18,323	16,970	·92615

Now, assuming that there *is* a virtue in selection, it would be found, but for the irregularities which affect all observations of the kind, that commencing at the bottom of the table and reading upwards, the probabilities would continually diminish until we should reach the class, or the first of the classes, the lives in which have been assured so long that the effect of selection has been exhausted from among them; and from this point still reading upwards, the probabilities would be all alike. The figures in antique type furnish a continuous summation of the separate classes, and it follows from what has just been remarked, that so long as the probability calculated from a particular class (and expressed in common type) exceeds the probability immediately above it (which is derived from all lives now of the same age, but longer insured), so long selection has an effect in that class.

The table on the next page shows, at one view, the whole of these probabilities, both selected and mixed. The line-bar shows the duration of time during which the effect of selection is apparent in the actual probabilities; and as it is rather irregular, the dotted bar shows a modification of its course, which has been made with a view to the adjustment of the resulting tables. This dotted bar has been drawn in conformity with an arbitrary rule, which at the same time was easy of application and in general agreement with the actual figures, viz. that the period during which selection exercises an effect, is half the difference between the age at entry and age 80. At the older ages a rule of this kind will of course fail; and accordingly I assume that after the age of 70 the required period is the same as at that age, viz. 5 years.

Year of risk.	Age when Assured.														
Age.	5.	10.	15.	20.	25.	30.	35.	40.	45.	50.	55.	60.	65.	70.	75.
7	**·99687**														
	·99687														
12	**·99371**	**·99408**													
	·99371	·99403													
17	**1·**	**·99667**	**·99170**												
	1·	·99697	·99305												
22	**1·**	**·98958**	**·99181**	**·99129**											
	1·	·99065	·99145	·99129											
27	**1·**	**·99275**	**·99268**	**·99120**	**·99216**										
	1·	·99346	·99296	·99154	·99206										
32	**1·**	**1·**	**·98546**	**·98937**	**·99138**	**·99250**									
	1·	1·	·99104	·98971	·99113	·99211									
37	**1·**	**1·**	**·98394**	**·98458**	**·98828**	**·98917**	**·99022**								
	1·	1·	·99070	·98564	·98787	·98880	·98965								
42		**·97958**	**·98528**	**·98197**	**·98664**	**·98828**	**·98796**	**·99074**							
		·97958	·98290	·98213	·98594	·98760	·98783	·98919							
47		**·94117**	**1·**	**·97913**	**·98360**	**·98492**	**·98587**	**·98562**	**·98771**						
		·94117	·98163	·97947	·98292	·98433	·98521	·98539	·98635						

The Bar marks the period during which the effect of selection is observable, by the excess of the probability in common type over that in antique type, in the preceding column.

——— rough. • • • adjusted.

The subsequent Tables of "Mixed Mortality" are framed by a combination of all the data which supplied the probabilities on the left side of the Bar; the tables of selected or "Class Mortality" are formed from the probabilities on the right of the Bar, and merge in the mixed table at the point where they cross the Bar.

·99216 = Prob. of living a Year, determined from those Lives only which were assured at the Age stated at the top of the column.

·99206 = Prob. of living a Year, determined from Lives assured at the said Age, and at all [Younger Ages.

52		·93333	·92308	·97396	·97425	·97787	·98168	·98188	·98075	·98313					
		·93333	·92856	·96819	·97333	·97663	·97942	·98057	·98064	·98152					
57		1·	1·	·97351	·96017	·96710	·97277	·97692	·97537	·97618	·97893				
		1·	1·	·97789	·96256	·96603	·96988	·97315	·97400	·97474	·97598				
62		1·	1·	·96552	·97246	·94980	·96263	·96452	·96690	·96445	·96594	·97293			
		1·	1·	·97500	·97279	·95475	·95956	·96201	·96385	·96405	·96458	·96663			
67		1·	1·	1·	·97850	·92835	·94761	·95074	·94589	·94639	·94391	·95080	·96336		
		1·	1·	1·	·98247	·93882	·94443	·94779	·94704	·94683	·94604	·94717	·95028		
72				·5	1·	·90908	·93250	·91647	·91721	·91854	·92820	·93098	·93244	·93532	
				·5	·9	·90849	·92679	·92104	·91943	·91912	·92159	·92389	·92549	·92615	
77					·66667	·93333	·85658	·89964	·91016	·90109	·90022	·89565	·89064	·89613	·93940
					·66667	·90909	·86750	·88799	·89890	·89975	·89991	·89894	·89726	·89720	·89871
82						·87500	·83333	·85937	·91296	·88277	·85041	·83595	·87173	·91971	·92308
						·87500	·85000	·85714	·82960	·85532	·85361	·84965	·85332	·85747	·85973
87						0·	0·	·85714	·84000	·81679	·78219	·89285	·82075	·92856	·80952
						0·	0·	·66667	·79411	·80906	·80000	·82524	·82433	·82968	·82893
92								1·	No exp.	·80000	0·	·63636	·85714	No experience.	
								1·	1·	·85714	·80000	·73077	·75758	·75758	·75758

O

In the table just given, the probabilities are represented for the sake of convenience as corresponding to the mean age of the five over which the combination extends. This would be correct if the numbers exposed to risk in each year separately were uniform, and if the probabilities decreased by a law of first differences. But while the probabilities obviously diminish by increasing differences, this is in some cases counterbalanced, and in others much more than counterbalanced by the extreme rapidity with which the numbers at risk diminish. Accordingly the probability derived from the quinary combination has been assumed correct for the mean age in the separate classes, where the probabilities diminish rapidly; and for an age a quarter of a year younger in the case of the mixed lives, where (except at the advanced ages) the second differences are trifling*. At the beginning and end of the separate tables, that is to say for the first five years after selection, and for all ages after 75, this combination has not been made, but the probabilities have been taken separately for every year.

The probability of surviving the year immediately after selection, is a quantity which we have not at present the means of measuring. The approximate value which I have used is combined of the elements exhibited in the following tables, viz.—

First. The probability of surviving to the end of the *calendar* year of admission. The office age at entry being m years, these lives are assumed on an average to have been at risk during the last half of the year following their completion of age $m-1$†.

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* The number exposed to risk at age m is (in the greater part of the table), to the number exposed to risk at age $m+4$, about as 10 to 6. Supposing the intermediate numbers to be 9, 8 and 7, and the probabilities to diminish by second differences, the probability deduced from the quinary combination, which I refer to age $m+1\frac{3}{4}$ as respects the mixed lives, will be

$$= \text{first term } + \frac{7}{4}d_1 + \frac{52}{32}d_2.$$

The real probability is $= \text{first term } + \frac{7}{4}d_1 + \frac{21}{32}d_2.$

The difference is $= \frac{31}{32}d_2$, a quantity so small during the early and middle ages as to be immaterial. As d_2 is negative, the error lies on the side of underrating the chance of life. For this, abundant compensation will be suggested hereafter.

† It is assumed (agreeably to the precedent of the Committee who collected the data) that the assured entered on an average at the middle of the calendar year; being on an average half a year younger than their office age. The Equitable and Amicable data are given for actual calendar years, but they do not afford the means of determining the probability of living from the time of admission to the 1st of January following.

In this table the deaths are doubled, and the lives are supposed to have been at risk during a whole year. (In *all* the other tables both the living and dying are doubled, in order to avoid fractions.)

TABLE F.

Age.	Actuaries' Male Lives.			Actuaries' Female Lives.		
	No. at risk.	No. who survived.	Probability of living a year.	No. at risk.	No. who survived.	Probability of living a year.
19	896	892	·99563	259	255	·98446
24	3013	3005	·99724	231	231	1·
29	4790	4762	·99426	315	311	·98742
34	5261	5233	·99449	384	380	·98969
39	4397	4373	·99449	432	424	·98152
44	3504	3486	·99495	387	387	1·
49	2465	2441	·99038	418	414	·99038
54	1550	1530	·98719	325	325	1·
59	918	900	·98039	246	246	1·
64	436	432	·99083	130	128	·98469
69	93	89	·95697	42	36	·85724
74	28	26	·92854	8	8	1·

Secondly. The probability of surviving the first entire calendar year after entry, the year being on an average that immediately after completion of age *m*, and extending from the end of the sixth to the end of the eighteenth month after entry.

TABLE G.

Age.	Actuaries' Male Lives.			Actuaries' Female Lives.			Equitable.			Amicable.		
	No. at risk.	No. who survived.	Probability of living a year.	No. at risk.	No. who survived.	Probability of living a year.	No. at risk.	No. who survived.	Probability of living a year.	No. at risk.	No. who survived.	Probability of living a year.
20	1442	1424	·98742	435	423	·97230	2939	2927	·99586	146	145	·99312
25	5197	5145	·98992	396	392	·98992	5915	5897	·99678	690	687	·99586
30	8445	8407	·99563	549	539	·98175	7679	7659	·99747	1264	1254	·99197
35	9311	9235	·99197	664	660	·99380	7361	7339	·99678	1463	1449	·99038
40	7716	7660	·99266	761	757	·99472	6085	6061	·99609	1351	1340	·99197
45	6217	6139	·98742	674	664	·98514	4710	4684	·99449	1052	1043	·99129
50	4366	4314	·98810	736	728	·98901	3271	3233	·98855	778	771	·99106
55	2681	2635	·98288	577	565	·97904	2077	2051	·98742	566	552	·97521
60	1579	1525	·96561	404	394	·97521	1186	1172	·98810	371	363	·97836
65	768	730	·95039	232	222	·95697	500	494	·98787	200	195	·97499
70	152	144	·94755	64	64	1·	6	6	1·	69	63	·91306
75	48	48	1·	11	11	1·	8	8	1·	none		

TABLE H.—*Probability of living a year, derived from a combination of all the foregoing materials.*

Age.	Number at risk.	Number who survived.	Probability of living a year.	Same slightly adjusted.
20	6,117	6,066	·99175	
25	15,442	15,357	·99449	·99586
30	23,042	22,932	·99518	·99518
35	24,444	24,296	·99380	·99426
40	20,742	20,615	·99380	·99380
45	16,544	16,403	·99152	·99152
50	12,034	11,901	·98878	·98878
55	7,776	7,658	·98514	·98514
60	4,704	4,600	·97791	·98017
65	2,266	2,201	·97118	·97118
70	426	402	·94363	·95724
75	103	101	(·98062)	·93975

The general table, in which all the separate classes are merged at the advanced ages, may be considered more accurate for those ages than any at present in use.

It is rather curious to trace the history of the value of 4·75 years' purchase which is so commonly given as the complete expectation of life at age 80. The Committee of 1838 borrowed it from Mr. Morgan, probably because they mistrusted the larger value (5·13) which their own data would have given. Mr. Morgan did not obtain it from his materials. They give a value of 5·51, which, perhaps, he rejected for the same reason. He evidently borrowed from the Northampton Table by Dr. Price, and considering that Dr. Price had no more minute materials than the number of deaths between 80 and 90, and the number between 90 and 100, we may be allowed to question the accuracy of his deductions.

The Carlisle Table, through its whole extent, is of no authority, and at the extreme ages it is absolutely useless and absurd. The numbers on which it is founded are so small, that it owes its popularity entirely to the accident that it happens to agree pretty nearly with other observations.

The values at the older ages in Mr. Davies's Tables are based on a mere assumption, though a happy one; and one cannot receive with entire confidence those of Mr. Farr, considering the loose manner in which the ages of individuals, supposed to be octogenarians, or even older, are returned to the registrars of deaths.

It appears therefore desirable to furnish at length the following Table of Probabilities, both rough and adjusted, for ages 75 and upwards. It will be borne in mind that the actual numbers are but half those stated in the table; still they are large enough to entitle the resulting values to confidence. The lives insured at the age of 75 are not included for the first five years after entry, as the table represents the probabilities of life in respect of persons among whom the effect of selection has been exhausted.

TABLE I.—*Mixed Mortality. Age 75 and upwards.*

Age.	Number at risk.	Number who survived.	Rough probability of living a year.	Rough complete expectation.	Adjusted probability of living a year.	Adjusted complete expectation.
75	2089	1896	·90761	7·06	·90890	7·08
76	1715	1542	·89912	6·72	·90237	6·74
77	1397	1239	·88691	6·42	·89538	6·42
78	1105	993	·89865	6·18	·88805	6·11
79	883	780	·88334	5·82	·88052	5·82
80	720	613	·85139	5·52	·87290	5·54
81	553	495	·89512	5·40	·86533	5·27
82	436	364	·83485	4·98	·85793	5·02
83	326	278	·85276	4·86	·85082	4·76
84	239	205	·85774	4·61	·84414	4·51
85	191	172	·90052	4·30	·83801	4·25
86	154	127	·82467	3·72	·83415	3·98
87	112	85	·75892	3·40	·82432	3·67
88	67	55	·82090	3·32	·80853	3·34
89	43	31	·72093	2·93	·78677	3·02
90	26	20	·76923	2·87	·75904	2·70
91	20	16	·80000	2·59	·72534	2·40
92	12	8	·66667	2·11	·68568	2·12
93	8	6	·75000	1·91	·64005	1·86
94	none	....	....	1·38	·58845	1·63
95	....	....	....		·53088	1·42
96	....	....	....	from	·46734	1·23
97	....	....	....	Davies.	·39783	1·06
98	....	....	....	....	·32235	·91
99	....	....	....	....	·24090	·78
100	....	....	....	....	·15348	·66
101	....	....	....	....	·06009	·56
102	....	....	....	....	0	·50

Comparative Statement. Expectation of Life.

Age.	Rough values from above.	Adjusted.	Actuaries' rough materials.	Morgan's rough materials.	Carlisle.	Davies.	Farr (Males).
75	7·06	7·08	6·67	7·02	7·01	7·52	6·55
80	5·52	5·54	5·13	5·52	5·51	5·38	4·94
85	4·30	4·25	3·99	4·03	4·12	3·73	3·68
90	2·87	2·70	3·14	2·48	3·28	2·65	2·73
95	....	1·42	1·17	....	3·53	1·05	2·02

The probabilities for the years immediately after admission, and those for the old ages having been determined in the manner stated, the middle part of the tables was supplied as follows, viz. the several probabilities immediately on the left-hand of the dotted bar in Table E. having been taken out, the intermediate terms were interpolated, and thus the table for mixed lives hereafter given was obtained.

The values on the right-hand of the bar (after a slight adjustment) were similarly used in computing the tables for selected lives. These tables, of course, merge in the mixed table at the point where they cross the bar, and where, by the rule, the effect of selection ceases in each case.

On comparing the probabilities of living a year in the separate classes with those of Mr. Farr, given in the reports of the Registrar-General, one is struck with the fact that assured lives are, for some time after selection, much better than the community at large, but that after a while they become much worse. If the comparison be made with a table representing the chances of life in the better classes of society, to which assured lives generally belong, their inferiority after a short period of assurance will be still more strongly exhibited. There can be nothing in their constitution or circumstances to account for this; and it can arise from no other cause than *the selection which the assured exercise against the Companies* by dropping policies on healthy lives and retaining those on lives which have become bad or doubtful. Various writers who have noticed the inferiority of assured lives taken in the mass, have hastily concluded that the care which the Companies exercise in the admission of applicants fails of its purpose, through the incompleteness of the information they obtain, and the occasional success of dishonest speculators. But if this were so, it would be apparent from the outset; whereas, in the early years after entry, the reverse is the case. I conclude, therefore, that if we could trace the after-history of *all* who appear upon our books, we should find that they really were, as a whole, the select lives we supposed them to be on their admission;—that those who dropped their policies were those who permanently enjoyed good health; while those who had fallen into bad health were careful to retain them.

I am not aware that attention has previously been called to this point, but it is one deserving of very serious consideration, especially by those who are accustomed to regard lapsed assurances as a source of profit. It might be so if the policies to be dropped were settled by lot; but seeing that a power of selection is exercised in opposition to the interests of the Company, there is every reason to fear that a loss instead of a gain is the result. It is true, a measure of profit is shown upon the immediate transaction, inasmuch as the Company are enabled to dispose of their reserve in respect of the policies surrendered. But this is so obviously done at the expense of the future, that one can hardly hear a Company congratulating themselves on their large profits from discontinued policies, without being reminded of the man in the fable, who cut open his goose to secure the golden eggs.

Assuming the correctness of the Table of Mixed Mortality now submitted, it is evident that the RESERVE of an Assurance Company ought not to be made on the assumption that the duration of the lives assured will be in conformity with the general law; much less should tables showing a *greater* expectation of life be used, such for instance as the Carlisle, unless with a considerable per-centage of addition to the results. This applies with peculiar force to the valuation of the liabilities of a Company with a view to their transfer to another office; because such arrangements must always, more or less, unsettle the assured, and lead to the discontinuance of policies which would otherwise have been kept in force.

The easy terms on which unsuccessful Companies have succeeded in transferring their risks have often occasioned surprise, and have had a mischievous effect in encouraging the for-should be so thrown together, to avoid the irregularities at the older ages occasioned by the small numbers to which the classes have dwindled.

With a view to determine the length of time during which selection continues to exercise an influence, and during which, consequently, the classes must be kept apart, the numbers exposed to risk, and the numbers who survived, were combined for each class in quinary sets, and probabilities of living a year were thence deduced. The following is an example of the resulting table :—

TABLE D.—*Years of risk, ages* 70, 71, 72, 73 *and* 74.

	Number at risk.	Number who survived.	Probability of living a year.
Lives selected at age 20	4	2	·50000
„ „ 25	4 16	2 16	·50000 1·
„ „ 30	20 286	18 260	·90000 ·90908
„ „ 35	306 978	278 912	·90849 ·93250
„ „ 40	1,284 1,604	1,190 1,470	·92679 ·91647
„ „ 45	2,888 2,126	2,660 1,950	·92104 ·91721
„ „ 50	5,014 2,615	4,610 2,402	·91943 ·91854
„ „ 55	7,629 2,855	7,012 2,650	·91912 ·92820
„ „ 60	10,484 3,390	9,662 3,156	·92159 ·93098
„ „ 65	13,874 3,197	12,818 2,981	·92389 ·93244
„ „ 70	17,071 1,252	15,799 1,171	·92549 ·93532
	18,323	16,970	·92615

Now, assuming that there *is* a virtue in selection, it would be found, but for the irregularities which affect all observations of the kind, that commencing at the bottom of the table and reading upwards, the probabilities would continually diminish until we should reach the class, or the first of the classes, the lives in which have been assured so long that the effect of selection has been exhausted from among them; and from this point still reading upwards, the probabilities would be all alike. The figures in antique type furnish a continuous summation of the separate classes, and it follows from what has just been remarked, that so long as the probability calculated from a particular class (and expressed in common type) exceeds the probability immediately above it (which is derived from all lives now of the same age, but longer insured), so long selection has an effect in that class.

The table on the next page shows, at one view, the whole of these probabilities, both selected and mixed. The line-bar shows the duration of time during which the effect of selection is apparent in the actual probabilities; and as it is rather irregular, the dotted bar shows a modification of its course, which has been made with a view to the adjustment of the resulting tables. This dotted bar has been drawn in conformity with an arbitrary rule, which at the same time was easy of application and in general agreement with the actual figures, viz. that the period during which selection exercises an effect, is half the difference between the age at entry and age 80. At the older ages a rule of this kind will of course fail; and accordingly I assume that after the age of 70 the required period is the same as at that age, viz. 5 years.

Irregular Ratios.

Age.	Mortality per cent. by Mr. Neison's Table.	p_x.	Log p_x.	Log l_x.
18	1·506	·984940	$\bar{1}$·9934098	·0000000
19	1·773	·982269	·9922305	·9934098
20	1·955	·980454	·9914273	·9856403
21	1·890	·981104	·9917151	·9770676
22	2·324	·976764	·9897897	·9687827
23	2·345	·976549	·9896941	·9585724
24	2·668	·973323	·9882570	*·9482665*
25	2·457	·975434	·9891979	·9365235
26	2·554	·974461	·9887645	·9257214
27	2·077	·979235	·9908869	·9144859
28	2·253	·977466	·9901016	·9053728
29	2·967	·970335	·9869217	·8954744
30	2·724	·972758	·9880048	·8823961
31	2·593	·974069	·9885898	·8704009
32	2·644	·973565	·9883650	·8589907
33	3·068	·969323	·9864686	·8473557
34	2·777	·972229	·9877686	*·8338243*
35	2·850	·971502	·9874437	·8215929
36	3·260	·967403	·9856075	·8090366
37	2·704	·972965	·9880972	·7946441
38	3·064	·969361	·9864856	·7827413
39	2·573	·974267	·9886780	·7692269
40	2·587	·974128	·9886160	·7579049
41	3·803	·961971	·9831620	·7465209
42	2·363	·976366	·9896126	·7296829
43	2·756	·972437	·9878615	·7192955
44	2·893	·971069	·9872501	*·7071570*
45	2·839	·971611	·9874924	·6944071
46	2·796	·972040	·9876841	·6818995
47	3·903	·960967	·9827085	·6695836
48	3·766	·962343	·9833299	·6522921
49	4·508	·954923	·9799684	·6356220
50	4·468	·955322	·9801498	·6155904
51	4·118	·958824	·9817389	·5957402
52	2·913	·970874	·9871629	·5774791
53	2·162	·978379	·9905072	·5646420
54	2·751	·972495	·9878874	*·5551492*
55	2·637	·973627	·9883926	·5430366
56	2·985	·970149	·9868385	·5314292
57	5·085	·949153	·9773363	·5182677
58	5·448	·945525	·9756730	·4956040
59	3·922	·960784	·9826258	·4712770
60	3·659	·963415	·9838134	·4539028
61	1·695	·983051	·9925760	·4377162
62	4·545	·954546	·9797969	·4302922
63	7·692	·923077	·9652379	·4100891
64	6·250	·937500	$\bar{1}$·9719713	*·3753270*

Graduated Ratios.

Log l_x.	Log p_x.	p_x.	Mortality per cent.	Age.
·01066	$\bar{1}$·99008	·97742	2·258	18
·00074	·98986	·97692	2·308	19
·99060	·98966	·97647	2·353	20
·98026	·98948	·97607	2·393	21
·96974	·98933	·97572	2·428	22
·95907	·98919	·97542	2·458	23
·94826	·98907	·97515	2·485	24
·93733	·98897	·97492	2·508	25
·92630	·98885	·97465	2·535	26
·91515	·98873	·97438	2·562	27
·90388	·98862	·97414	2·586	28
·89250	·98850	·97387	2·613	29
·88100	·98839	·97362	2·638	30
·86939	·98826	·97333	2·667	31
·85765	·98815	·97308	2·692	32
·84580	·98802	·97279	2·721	33
·83382	·98791	·97254	2·766	34
·82173	·98778	·97225	2·775	35
·80951	·98765	·97196	2·804	36
·79716	·98753	·97170	2·830	37
·78469	·98740	·97141	2·859	38
·77209	·98728	·97113	2·887	39
·75937	·98714	·97082	2·918	40
·74651	·98702	·97055	2·945	41
·73353	·98687	·97022	2·978	42
·72040	·98675	·96995	3·005	43
·70715	·98593	·96812	3·188	44
·69308	·98569	·96758	3·242	45
·67877	·98544	·96703	3·297	46
·66421	·98519	·96647	3·353	47
·64940	·98495	·96593	3·407	48
·63435	·98469	·96536	3·464	49
·61904	·98442	·96476	3·524	50
·60346	·98417	·96421	3·579	51
·58763	·98390	·96360	3·640	52
·57153	·98362	·96298	3·702	53
·55515	·98335	·96238	3·762	54
·53850	·98306	·96174	3·826	55
·52156	·98278	·96112	3·888	56
·50434	·98249	·96048	3·952	57
·48683	·98219	·95983	4·017	58
·46902	·98187	·95912	4·088	59
·45089	·98159	·95849	4·151	60
·43248	·98127	·95778	4·222	61
·41375	·98095	·95708	4·292	62
·39470	·98063	·95637	4·363	63
·37533	$\bar{1}$·98014	·95530	4·470	64

Graduated Ratios (continued).

Age.	Log l_x.	Log p_x.	p_x.	Mortality per cent.	Mortality per cent. by Mr. Neison's Table.
65	·35547	$\bar{1}$·97914	·95311	4·689	4·692
66	·33461	·97755	·94961	5·039	5·039
67	·31216	·97576	·94572	5·428	5·428
68	·28792	·97378	·94141	5·859	5·859
69	·26170	·97160	·93670	6·330	6·330
70	·23330	·96922	·93157	6·843	6·843
71	·20252	·96663	·92603	7·397	7·397
72	·16915	·96371	·91984	8·016	8·016
73	·13286	·96048	·91301	8·699	8·699
74	·09334	·95691	·90554	9·446	9·446
75	·05025	·95299	·89741	10·259	10·259
76	·00324	·94873	·88865	11·135	11·135
77	·95197	·94414	·87930	12·070	12·070
78	·89611	·93921	·86938	13·062	13·062
79	·83532	·93393	·85888	14·112	14·112
80	·76925	·92829	·84780	15·220	15·220
81	·69754	·92480	·84100	16·385	16·385
82	·62234	·90379	·80128	19·872	17·620
83	·52613	·85898	·72273	27·727	18·924
84	·38511	_·74008	·54964	45·036	20·298
85	·12519	$\bar{1}$·00000	·00000	100·000	21·740

Bengal Military Mortality, 4 *per cent*. (*From* Mr. Neison's *data*).

Age.	L_x.	D.	N.	Annuity.	Annual premium.
18	10248	5058·700	72309·9012	14·294	2·692
19	10017	4754·488	67555·4132	14·209	2·729
20	9786	4466·202	63089·2112	14·126	2·766
21	9556	4193·498	58895·7132	14·044	2·801
22	9327	3935·574	54960·1392	13·965	2·836
23	9101	3692·513	51267·6262	13·884	2·872
24	8877	3463·104	47804·5222	13·804	2·909
25	8656	3247·013	44557·5092	13·723	2·945
26	8439	3043·853	41513·6562	13·638	2·985
27	8225	2852·569	38661·0872	13·553	3·025
28	8015	2672·818	35988·2692	13·465	3·066
29	7807	2503·322	33484·9472	13·376	3·110
30	7604	2344·457	31140·4902	13·283	3·155
31	7403	2194·693	28945·7972	13·189	3·201
32	7205	2053·843	26891·9542	13·093	3·249
33	7011	1921·673	24970·2812	12·994	3·300
34	6821	1797·689	23172·5922	12·890	3·353
35	6633	1680·901	21491·6912	12·786	3·408
36	6449	1571·420	19921·2712	12·677	3·465
37	6268	1468·572	18452·6992	12·565	3·525
38	6091	1372·210	17080·4892	12·447	3·590
39	5917	1281·746	15798·7432	12·326	3·657
40	5746	1196·827	14601·9162	12·201	3·729
41	5578	1117·150	13483·7662	12·070	3·805
42	5414	1042·601	12441·1652	11·933	3·886
43	5253	972·687	11468·4782	11·791	3·971
44	5093	906·788	10561·6902	11·647	4·061
45	4933	844·519	9717·1712	11·506	4·150
46	4773	785·703	8931·4682	11·367	4·240
47	4616	730·634	8200·8342	11·224	4·334
48	4461	678·941	7521·8932	11·079	4·433
49	4309	630·583	6891·3102	10·928	4·537
50	4160	585·366	6305·9442	10·773	4·648
51	4013	542·963	5762·9812	10·614	4·764
52	3869	503·344	5259·6372	10·449	4·888
53	3729	466·471	4793·1662	10·275	5·023
54	3591	431·932	4361·2342	10·097	5·165
55	3455	399·591	3961·6432	9·914	5·316
56	3323	369·541	3592·1022	9·721	5·481
57	3194	341·535	3250·5672	9·518	5·662
58	3068	315·442	2935·1252	9·305	5·858
59	2945	291·151	2643·9742	9·081	6·073
60	2824	268·449	2375·5252	8·849	6·307
61	2706	247·339	2128·1862	8·604	6·567
62	2593	227·895	1900·2912	8·338	6·862
63	2481	209·664	1690·6272	8·063	7·187
64	2373	192·825	1497·8022	7·767	7·560
65	2267	177·128	1320·6742	7·456	7·980
66	2161	162·351	1158·3232		
67	2052	148·232	1010·0912		205·126
68	1941	134·821	875·2702		
69	1827	122·021	753·2492		
70	1711	109·878	643·3712		
71	1594	98·428	544·9432		
72	1476	87·636	457·3072		
73	1358	77·529	379·7782		
74	1240	68·070	311·7082		
75	1123	59·276	252·4322		
76	1008	51·160	201·2722		
77	895	43·6769	157·5953		
78	787	36·9291	120·6662		
79	684	30·8621	89·8041		
80	588	25·5097	64·2944		
81	498	20·7745	43·5199		
82	419	16·8065	26·7134		
83	336	12·9592	13·7542		
84	243	9·0116	4·7426		
85	133	4·7426			

TABLE M.—*Mixed Mortality adjusted. Lives from among whom the effect of selection has been exhausted.*

Age.	Probability of living a year.	Complete expectation of life.	Annuity, 3 per cent.	Annuity, 3½ per cent.	Age.	Probability of living a year.	Complete expectation of life.	Annuity, 3 per cent.	Annuity, 3½ per cent.
7	·99669	48·12	23·36	21·27	55	·97092	16·47	11·70	11·18
8	·99600	47·27	23·14	21·10	56	·97039	15·95	11·42	10·91
9	·99538	46·46	22·93	20·91	57	·97002	15·42	11·12	10·64
10	·99482	45·67	22·73	20·75	58	·96973	14·88	10·80	10·35
11	·99434	44·91	22·53	20·59	59	·96911	14·33	10·47	10·04
12	·99398	44·17	22·35	20·44	60	·96769	13·76	10·13	9·73
13	·99378	43·43	22·15	20·28	61	·96566	13·22	9·78	9·40
14	·99358	42·70	21·96	20·12	62	·96296	12·66	9·43	9·08
15	·99339	41·98	21·76	19·96	63	·95939	12·13	9·09	8·76
16	·99319	41·26	21·56	19·80	64	·95586	11·63	8·76	8·45
17	·99299	40·54	21·36	19·63	65	·95233	11·14	8·44	8·15
18	·99274	39·82	21·15	19·46	66	·94876	10·67	8·13	7·85
19	·99252	39·12	20·95	19·29	67	·94515	10·22	7·82	7·57
20	·99231	38·41	20·74	19·12	68	·94153	9·79	7·52	7·29
21	·99215	37·71	20·54	18·94	69	·93764	9·36	7·23	7·01
22	·99208	37·01	20·32	18·76	70	·93347	8·96	6·94	6·74
23	·99201	36·30	20·09	18·58	71	·92901	8·56	6·66	6·47
24	·99196	35·60	19·87	18·38	72	·92445	8·17	6·39	6·21
25	·99185	34·88	19·63	18·18	73	·92007	7·80	6·12	5·95
26	·99169	34·16	19·38	17·97	74	·91484	7·43	5·85	5·69
27	·99149	33·44	19·14	17·75	75	·90890	7·08	5·58	5·44
28	·99128	32·72	18·88	17·53	76	·90237	6·74	5·33	5·20
29	·99098	32·00	18·62	17·30	77	·89538	6·42	5·08	4·96
30	·99059	31·28	18·35	17·07	78	·88805	6·11	4·84	4·73
31	·99012	30·57	18·08	16·84	79	·88052	5·82	4·62	4·52
32	·98950	29·88	17·81	16·60	80	·87290	5·54	4·40	4·31
33	·98865	29·19	17·54	16·36	81	·86533	5·27	4·19	4·11
34	·98782	28·52	17·27	16·14	82	·85793	5·02	3·99	3·91
35	·98701	27·86	17·01	15·90	83	·85082	4·76	3·79	3·72
36	·98623	27·23	16·75	15·67	84	·84414	4·51	3·59	3·52
37	·98545	26·60	16·49	15·44	85	·83801	4·25	3·38	3·32
38	·98470	25·99	16·24	15·23	86	·83415	3·98	3·15	3·10
39	·98397	25·38	15·98	15·00	87	·82432	3·67	2·89	2·85
40	·98328	24·79	15·73	14·78	88	·80853	3·34	2·61	2·58
41	·98262	24·20	15·47	14·55	89	·78677	3·02	2·33	2·30
42	·98207	23·62	15·22	14·33	90	·75904	2·70	2·05	2·02
43	·98178	23·05	14·97	14·10	91	·72534	2·40	1·78	1·76
44	·98136	22·47	14·70	13·88	92	·68568	2·12	1·52	1·51
45	·98079	21·89	14·43	13·63	93	·64005	1·86	1·29	1·28
46	·98008	21·31	14·15	13·39	94	·58845	1·63	1·07	1·06
47	·97911	20·72	13·87	13·13	95	·53088	1·42	·88	·87
48	·97768	20·16	13·60	12·88	96	·46734	1·23	·70	·69
49	·97637	19·61	13·33	12·64	97	·39783	1·06	·54	·54
50	·97517	19·07	13·06	12·40	98	·32235	·91	·40	·40
51	·97408	18·54	12·79	12·15	99	·24090	·78	·27	·27
52	·97310	18·02	12·52	11·92	100	·15348	·66	·16	·16
53	·97224	17·50	12·26	11·68	101	·06009	·56	·06	·06
54	·97153	16·99	11·99	11·43	102	....	·50		

TABLE N.—*Class Mortality adjusted.*

Lives assured at age 25.

Age.	Probability of living a year.	Complete expectation.	Annuity, 3 per cent.	Annuity, 3½ per cent.	Age.	Probability of living a year.	Complete expectation.	Annuity, 3 per cent.	Annuity, 3½ per cent.
25	·99586	36·50	20·32	18·78	40	·98749	25·86	16·35	15·36
26	·99220	35·66	20·01	18·52	41	·98723	25·18	16·05	15·09
27	·99194	34·93	19·77	18·32	42	·98696	24·51	15·75	14·83
28	·99167	34·21	19·53	18·12	43	·98680	23·82	15·43	14·55
29	·99140	33·49	19·28	17·91	44	·98640	23·13	15·11	14·26
30	·99113	32·78	19·04	17·70	45	·98577	22·45	14·78	13·96
31	·99086	32·07	18·78	17·48	46	·98490	21·75	14·44	13·66
32	·99059	31·37	18·53	17·26	47	·98380	21·08	14·11	13·35
33	·99013	30·66	18·27	17·03	48	·98188	20·42	13·77	13·05
34	·98967	29·95	18·00	16·80	49	·97995	19·79	13·44	12·75
35	·98921	29·27	17·74	16·58	50	·97802	19·17	13·13	12·47
36	·98875	28·58	17·47	16·34	51	·97610	18·59	12·83	12·20
37	·98828	27·89	17·19	16·10	52	·97417	18·04	12·53	11·93
38	·98802	27·22	16·92	15·86	53	·97224	17·50	12·25	11·68
39	·98776	26·54	16·64	15·61	Merged from hence in Mixed Table.				
Lives assured at age 30.									
30	·99518	33·48	19·37	17·99	44	·98675	23·55	15·36	14·48
31	·99129	32·64	19·05	17·71	45	·98621	22·86	15·03	14·19
32	·99094	31·93	18·80	17·49	46	·98567	22·17	14·70	13·89
33	·99059	31·22	18·54	17·27	47	·98512	21·48	14·36	13·59
34	·99023	30·51	18·28	17·04	48	·98385	20·80	14·02	13·28
35	·98988	29·81	18·01	16·82	49	·98257	20·13	13·68	12·97
36	·98953	29·11	17·74	16·58	50	·98130	19·48	13·34	12·66
37	·98917	28·41	17·47	16·35	51	·98003	18·84	13·00	12·35
38	·98891	27·71	17·19	16·10	52	·97875	18·22	12·66	12·05
39	·98864	27·02	16·89	15·85	53	·97614	17·60	12·33	11·74
40	·98837	26·32	16·61	15·59	54	·97353	17·02	12·00	11·45
41	·98810	25·63	16·31	15·32	55	·97092	16·47	11·70	11·18
42	·98783	24·93	16·00	15·05	Merged from hence in Mixed Table.				
43	·98729	24·24	15·69	14·77					
Lives assured at age 35.									
35	·99426	30·38	18·30	17·06	48	·98458	21·17	14·26	13·50
36	·99015	29·56	17·96	16·76	49	·98368	20·49	13·91	13·19
37	·98981	28·85	17·68	16·52	50	·98278	19·82	13·56	12·87
38	·98947	28·14	17·39	16·28	51	·98189	19·16	13·21	12·55
39	·98912	27·43	17·11	16·03	52	·98099	18·50	12·86	12·23
40	·98878	26·73	16·82	15·77	53	·97912	17·85	12·50	11·91
41	·98844	26·03	16·52	15·51	54	·97724	17·22	12·15	11·60
42	·98809	25·33	16·21	15·24	55	·97536	16·62	11·80	11·27
43	·98757	24·63	15·90	14·96	56	·97349	16·02	11·47	10·96
44	·98705	23·93	15·58	14·68	57	·97161	15·45	11·14	10·65
45	·98653	23·24	15·26	14·40	58	·96973	14·88	10·80	10·35
46	·98600	22·54	14·93	14·10	Merged from hence in Mixed Table.				
47	·98547	21·86	14·59	13·80					

TABLE N.—*Class Mortality adjusted* (continued).

Age.	Probability of living a year.	Complete expectation.	Annuity, 3 per cent.	Annuity, 3½ per cent.	Age.	Probability of living a year.	Complete expectation.	Annuity, 3 per cent.	Annuity, 3½ per cent.
Lives assured at age 40.									
40	·99380	27·19	17·06	16·00	51	·98217	19·44	13·38	12·72
41	·98946	26·36	16·68	15·66	52	·98115	18·79	13·03	12·40
42	·98855	25·64	16·36	15·38	53	·98012	18·14	12·69	12·08
43	·98809	24·93	16·05	15·11	54	·97908	17·49	12·33	11·76
44	·98756	24·22	15·73	14·83	55	·97804	16·86	11·98	11·44
45	·98697	23·52	15·40	14·54	56	·97700	16·22	11·61	11·10
46	·98632	22·83	15·08	14·24	57	·97596	15·59	11·24	10·76
47	·98562	22·14	14·75	13·95	58	·97363	14·96	10·86	10·41
48	·98485	21·45	14·41	13·65	59	·97087	14·35	10·49	10·07
49	·98402	22·77	14·07	13·34	60	·96769	13·76	10·13	9·73
50	·98313	20·10	13·73	13·03	Merged from hence in Mixed Table.				
Lives assured at age 45.									
45	·99152	23·77	15·56	14·68	55	·97910	16·94	12·04	11·49
46	·98696	22·97	15·17	14·32	56	·97775	16·29	11·67	11·15
47	·98605	22·27	14·83	14·02	57	·97609	15·66	11·29	10·80
48	·98514	21·58	14·49	13·71	58	·97412	15·03	10·91	10·45
49	·98421	20·89	14·15	13·41	59	·97215	14·42	10·54	10·11
50	·98326	20·22	13·80	13·10	60	·96956	13·81	10·16	9·76
51	·98229	19·55	13·46	12·79	61	·96666	13·23	9·80	9·42
52	·98129	18·90	13·12	12·48	62	·96345	12·67	9·44	9·08
53	·98087	18·25	12·77	12·16	63	·95939	12·13	9·09	8·76
54	·98014	17·60	12·41	11·83	Merged from hence in Mixed Table.				
Lives assured at age 50.									
50	·98878	20·49	13·98	13·26	59	·97248	14·46	10·57	10·14
51	·98378	19·72	13·57	12·89	60	·97005	13·86	10·20	9·79
52	·98265	19·04	13·21	12·56	61	·96737	13·27	9·83	9·45
53	·98193	18·36	12·84	12·23	62	·96445	12·70	9·46	9·11
54	·98097	17·69	12·47	11·89	63	·96041	12·15	9·11	8·77
55	·97976	17·02	12·09	11·54	64	·95637	11·63	8·76	8·45
56	·97831	16·37	11·71	11·19	65	·95233	11·14	8·44	8·15
57	·97661	15·72	11·33	10·84	Merged from hence in Mixed Table.				
58	·97467	15·08	10·95	10·49					
Lives assured at age 55.									
55	·98514	17·35	12·30	11·74	63	·96188	12·21	9·15	8·81
56	·97972	16·60	11·87	11·34	64	·95781	11·68	8·80	8·49
57	·97836	15·93	11·48	10·98	65	·95374	11·17	8·46	8·17
58	·97684	15·27	11·08	10·61	66	·94967	10·69	8·14	7·86
59	·97484	14·63	10·69	10·25	67	·94560	10·23	7·83	7·57
60	·97235	13·99	10·29	9·88	68	·94153	9·79	7·53	7·29
61	·96939	13·37	9·90	9·52	Merged from hence in Mixed Table.				
62	·96594	12·78	9·52	9·16					

Table N.—*Class Mortality adjusted* (continued).

Age.	Probability of living a year.	Complete expectation.	Annuity, 3 per cent.	Annuity, 3½ per cent.	Age.	Probability of living a year.	Complete expectation.	Annuity, 3 per cent.	Annuity, 3½ per cent.
Lives assured at age 60.									
60	·98017	14·54	10·68	10·24	66	·95456	10·82	8·24	7·96
61	·97387	13·82	10·22	9·82	67	·94960	10·31	7·89	7·63
62	·97230	13·18	9·81	9·43	68	·94443	9·83	7·56	7·32
63	·96818	12·54	9·39	9·04	69	·93905	9·38	7·24	7·02
64	·96385	11·93	8·99	8·67	70	·93347	8·96	6·94	6·74
65	·95931	11·36	8·61	8·30	Merged from hence in Mixed Table.				
Lives assured at age 65.									
65	·97118	11·83	8·97	8·65	70	·93863	9·04	7·02	6·81
66	·96339	11·17	8·51	8·22	71	·93244	8·60	6·70	6·50
67	·95720	10·58	8·10	7·83	72	·92625	8·19	6·40	6·22
68	·95101	10·03	7·71	7·46	73	·92007	7·80	6·12	5·95
69	·94482	9·52	7·35	7·12	Merged from hence in Mixed Table.				
Lives assured at age 70.									
70	·95724	9·47	7·36	7·13	74	·91813	7·46	5·87	5·71
71	·94579	8·87	6·92	6·71	75	·90890	7·08	5·58	5·44
72	·93657	8·35	6·53	6·35	Merged from hence in Mixed Table.				
73	·92735	7·88	6·18	6·01					
Lives assured at age 75.									
75	·93975	7·62	6·03	5·87	79	8·8584	5·85	4·65	4·54
76	·92464	7·08	5·61	5·47	80	8·7290	5·54	4·40	4·31
77	·91171	6·62	5·25	5·12	Merged from hence in Mixed Table.				
78	·89877	6·21	4·92	4·81					

TABLE O.—*Comparative Table. Complete Expectation of Life.*

Age.	Mixed Mortality.	Class Mortality, Lives assured at Age											English Life Table, Males.	Davies's Equitable.	Carlisle.	Northampton.
		25.	30.	35.	40.	45.	50.	55.	60.	65.	70.	75.				
10	45·67	....	....	....	....	....	....	....	....	....	....	....	47·08	48·83	48·82	39·78
15	41·98	....	....	....	....	....	....	....	....	....	....	....	43·35	44·81	45·00	36·51
20	38·41	....	....	....	....	....	....	....	....	....	....	....	39·88	41·06	41·46	33·43
25	34·88	36·50	....	....	....	....	....	....	....	....	....	....	36·48	37·44	37·86	30·85
30	31·28	32·78	33·48	....	....	....	....	....	....	....	....	....	33·13	33·98	34·34	28·27
35	27·86	29·27	29·81	30·38	....	....	....	....	....	....	....	....	29·84	30·66	31·00	25·68
40	24·79	25·86	26·32	26·73	27·19	....	....	....	....	....	....	....	26·57	27·40	27·61	23·08
45	21·89	22·45	22·86	23·24	23·52	23·77	....	....	....	....	....	....	23·31	24·10	24·46	20·52
50	19·07	19·17	19·48	19·82	20·00	20·22	20·49	....	....	....	....	....	20·03	20·83	21·11	17·99
55	16·47	16·47	16·47	16·62	16·86	16·94	17·02	17·35	....	....	....	....	16·68	17·85	17·58	15·58
60	13·76	....	....	13·76	13·76	13·81	13·86	13·99	14·54	....	....	....	13·59	15·06	14·34	13·21
65	11·14	....	....	....	....	11·14	11·14	11·17	11·36	11·83	....	....	10·87	12·35	11·79	10·88
70	8·96	....	....	....	....	....	....	8·96	8·96	9·04	9·47	....	8·52	9·84	9·18	8·60
75	7·08	....	....	....	....	....	....	....	....	7·08	7·08	7·62	6·55	7·52	7·01	6·54
80	5·54	....	....	....	....	....	....	....	....	....	....	5·54	4·94	5·38	5·51	4·75
85	4·25	....	....	....	....	....	....	....	....	....	....	....	3·68	3·73	4·12	3·37
90	2·70	....	....	....	....	....	....	....	....	....	....	....	2·73	2·65	3·28	2·41
95	1·42	....	....	....	....	....	....	....	....	....	....	....	2·02	1·05	3·53	·75
100	·66	....	....	....	....	....	....	....	....	....	....	....	1·51	....	2·28	

French Rates for Insurance against Fire, according to nature of Risks, and Trades or Occupations.

IN our last Number we gave some details of the fires in London for seventeen years, classified under the different trades and occupations in which they occurred. In elucidation of the same subject, the following paper, containing the actual rates of premium charged by a French Fire Insurance Company, according to the greater or less danger attributed to the nature of the trade or manufacture, may be worthy of notice.

Rates of the Company, " La France Mutuelle," established for mutual insurances of houses, furniture and other property against fire, lightning, and explosion of gas.

Classification of risks and rates of premium.—The maximum charge for each risk is composed of the rate stated in the following table, together with a reserved charge of like amount left in the hands of the insured.

Insurance of buildings and other property not removeable.—Immoveable properties are classified in various divisions, and made subject to the rates of the Society in different proportions, according to the risks which they offer, arising either from the *nature of construction*, their *contents*, or the *nature of contiguous objects*.

Division I.—*Risks of Construction, or risks arising from the nature of the Property.*

1st Class comprises—1. In towns or boroughs, the principal towns of the department, arrondissement or canton, and in villages with an aggregate population of not less than 2000 inhabitants, such buildings as are entirely constructed of stone, brick or iron, with roofs of tiles, lava, slate or metal, and in which the interior walls are for the most part of incombustible materials.

2. Buildings, which are situated in any other rural commune, constructed in the interior or exterior of incombustible materials, and roofed like the preceding.

2nd Class comprises—1. Buildings, which, situated in towns, boroughs, or rural communes, described in the 1st Class (1.), are constructed entirely, or for the most part, as 1st Class (1.), and of which the interior walls are in wood panel, or in composition.

2. Buildings in any other rural commune, constructed as above, in which the interior walls are half in incombustible materials and half in wood panel.

3rd Class comprises—1. Buildings situated as in 1st Class (1.), and constructed for the most part in wood panel, both in the exterior and interior, with filling up in composition, clay or mud, and roofed with tile, slate or metal.

2. Buildings which, situated in any other rural commune, are constructed almost entirely of stone or brick, roofed with tile, slate or metal, and of which the walls are in wood or in composition.

3. Underwood of less growth than thirty years, and forests not of resinous trees.

4th Class comprises—1. Buildings situated as in 1st Class (1.), and entirely constructed of wood panel, with filling up in composition, clay or mud, or only in composition, and covered with tile, slate or metal.

2. Buildings situated in any other rural commune, and almost entirely constructed in wood or in composition, and roofed with tile, slate or metal.

3. Buildings used as bazaars, arcades, &c., when by their construction they come under the 1st or 2nd Class.

5th Class comprises—Buildings, which, situated either in towns or rural communes, are entirely, or for the most part, constructed in stone or brick, in the interior or exterior, and roofed with shingle, thatch or reeds, or any other similar material.

2. Buildings used as bazaars, arcades, &c., when by their construction they are placed in the 3rd or 4th Classes preceding.

6th Class comprises—Buildings situated in towns, boroughs and rural communes, which are constructed half in incombustible materials and half in wood panel, with filling-in of plaster, composition, clay or mud, or entirely in composition, and roofed, like the preceding, with thatch or other combustible material.

7th Class comprises—1. Buildings which are situated in towns and rural communes, and entirely constructed and roofed with combustible materials.

2. Woods and forests of resinous trees.

Rates of premium per £100.

1st Class.	2nd Class.	3rd Class.	4th Class.	5th Class.	6th Class.	7th Class.
·020.	·025.	·040.	·075.	·200.	·250.	·350.

Division II.—*Risks of Contents and of Occupation.*

The seven classes of buildings above enumerated are exposed, either by nature of the removeable contents, or the merchandize which they contain, or by reason of the trades exercised therein, to increased risks, the rates for which are added to the former. They form two heads: Risks of Contents and Risks of Occupation.

1. *Risks of Contents.*—Under this head are comprised, by reason of their more or less inflammable nature, removeable objects, or merchandize in buildings insured, either occupied by private individuals, or in depôts, magazines, workshops or other appertenances of such buildings.

The risks under this head are divided into four classes, corresponding to the 4th, 5th, 6th and 7th Classes of the insurance of removable property, distinguished according to the nature of the objects removeable and merchandize.

Each class of risks of contents is subject to—

Rates of premium per £100.

4th Class.	5th Class.	6th Class.	7th Class.
·025.	·030.	·060.	·090.

2. *Risks of Occupation.*—Under this head are classed all trades, in proportion to the nature of the materials employed, the process of manufacture, and the dangers to which the exercise of the occupation is liable.

Each class of risks is subject to—

Rates of premium per £100.

1st Class.	2nd Class.	3rd Class.	4th Class.	5th Class.	6th Class.	7th Class.
·005.	·010.	·025.	·080.	·100.	·175.	·300.

"Risks of contents" and "of occupation" are not in general liable to the two rates of premium added together; the higher rate of the two may be charged. The same remark applies to "risks of contiguity."

Division III.—*Risks of Contiguity.*

When the property offered for insurance adjoins other properties exposed to the risks of fire, such as are distinguished in any of the classes above described, either by the nature of their construction or of the removable objects contained in them, or of the trades carried on therein, the risk is considered to be increased, and liable to a further contribution added to the first. The risk of contiguity comprises three divisions. The first depends upon the construction of the contiguous buildings, according to the classification previously pointed out in the "Insurance of Buildings." The two others depend upon the nature of the "contents" of these "buildings," and of the trades exercised therein; and for these the reader must refer to the classifications in the insurance of removeable property.

The risk of contiguity renders the property insured liable to a fixed charge per cent.

	4th Class.	5th Class.	6th Class.	7th Class.
1. According to the nature of construction	·010	·040	·050	·075
2. According to the nature of the "contents"	·005	·010	·020	·040
3. According to the nature of the occupation	·030	·040	·050	·100

Insurance of Removeable Property.

Furniture, removeable objects, or merchandize, offered for insurance, are subject to different rates, according to the dangers to which they are liable.

1. According to their nature.
2. According to their position, with regard to the construction of the buildings in which they are placed, as well as the removeable objects contained therein, or the trades carried on there.
3. According to the construction, the contents, or the trade carried on in adjoining buildings.

They are consequently classified in three divisions, each of which is again subdivided in the following manner:—

Division I.—*Risks arising from the nature of the Property, combined with the risks arising from the construction of the Buildings.*

1st Class comprises—Furniture intended for the use or ornament of the apartments in which it is placed, such as beds, secretaires, chests of drawers, carpets, lamps, objects of art of ordinary character, and other articles not liable to be easily set on fire or damaged, such as—

- Bedding (of all kinds).
- Boots and shoes.
- Calicoes.
- Cattle (in the open air).
- Cloths.
- Coal (in the open air or in barges).
- Corks (in warehouse).
- Cotton (in bales).
- Firewood (in the open air or on barges).
- Flour.
- Grain and vegetables.
- Haberdashery.
- Horse-shoes, nails, &c.
- Hosiery.
- Ironmongery and hardware.
- Linen.
- Liquor (in casks).
- Mercers' goods.
- Playing-cards.
- Shawls (ordinary).
- Wines and liqueurs (not inflammable).
- Wool.
- Zinc.

Rates of premium per £100.

1st Class.	2nd Class.	3rd Class.	4th Class.	5th Class.	6th Class.	7th Class.
·045.	·055.	·065.	·100.	·200.	·250.	·300.

2nd Class comprises—Products and merchandize, which, not being easily combustible, are yet exposed, by their nature or their brittleness, to be damaged by fire, such as—

- Animals (shut up).
- Eatables (in large quantities).
- Farm instruments.
- Furs.
- Goldsmiths' stock.
- Hardware (of fine kinds).
- Leather and hides.
- Paper (in reams).
- Pewter articles.
- Pins and needles.
- Plates of metal (lead, &c.).
- Pottery and common china.
- Salts and soda.
- Slate.
- Tin articles.

Rates of premium per £100.

1st Class.	2nd Class.	3rd Class.	4th Class.	5th Class.	6th Class.	7th Class.
·050.	·060.	·075.	·110.	·210.	·260.	·315.

3rd Class comprises—Products and merchandize of a more inflammable nature than those enumerated in the 2nd Class, and which are either fragile or easily injured by fire, by explosion, or in the act of saving them, such as—

- Alabaster.
- Animals (covered with straw).
- Arms and wrought steel.
- Books.
- Bronze ornaments.
- Carpenters' work.
- Chemical products (not inflammable).
- Chocolate.
- Clocks.
- Coal and charcoal (warehoused in small quantities).
- Confectionary.
- Cordage (not tarred).
- Cotton (carded).
- Dredging-boats with tackle.
- Embroidery.
- Feathers.
- Firewood (warehoused, in small quantity).
- Flowers (artificial).
- Furniture (in warehouse).
- Gauze.
- Glass ware.
- Groceries.
- Hats (felt, straw or silk).
- Jewellery.
- Lace.
- Looking-glasses.
- Looms (weavers' and stocking).
- Mats.
- Millinery.
- Music (in shops).
- Objects of curiosity.
- Optical instruments.
- Perfumery.
- Pictures.
- Porcelain ornaments.
- Portmanteaus & trunks.
- Prints.
- Sealing-wax.
- Silk in hanks.
- Stoves (porcelain, in warehouse).
- Umbrellas.
- Wax lights.

Rates of premium per £100.

1st Class.	2nd Class.	3rd Class.	4th Class.	5th Class.	6th Class.	7th Class.
·060.	·070.	·080.	·120.	·220.	·270.	·350.

4th Class comprises—Products and merchandize of a still more inflammable nature than the preceding, or more likely to be injured by fire, &c., such as—

- Basket- and brush-makers' stock.
- Baths, or washerwomen's barges.
- Brandy (under 24 deg.).
- Candles.

Carriages.
Cloth-workers' frames.
Coal and charcoal (warehoused in large quantities).
Coverlets of wool.
Crops (in barns and granaries, in small quantities).
Drugs.
Firewood (warehoused, in large quantities).
Glue.
Hay and straw (in small quantities).
Leather (varnished).
Liqueurs.
Muslin (in large quantities).
Pianos and musical instruments (warehouses).
Silks, cloth and ribbons (in large quantity).
Taffety (waxed).
Timber-yards, and planks of wood for building.
Toys.
Wooden shoes (warehouses).
Woollen and silk cloths (stamped).

1st Class.	2nd Class.	3rd Class.	4th Class.	5th Class.	6th Class.	7th Class.
·075.	·085.	·095.	·140.	·230.	·280.	·375.

5th Class comprises—Products and merchandize, which, without being liable to spontaneous combustion, are likely to communicate fire easily, or to be seriously damaged by fire, or the means used to save them.

Cotton or wool (woven).
Cotton-waste.
Grain (in large quantities).
Hemp and flax.
Machines.
Merchandize (in transport).
Oil.
Pitch and tar.
Public magazines (goods in).
Resin.
Steam-engines (in action).
Sulphur.
Veneers.

1st Class.	2nd Class.	3rd Class.	4th Class.	5th Class.	6th Class.	7th Class.
·080.	·090.	·100.	·150.	·240.	·290.	·400.

6th Class comprises—Products and merchandize which burn readily, or are likely to catch fire from very slight causes, such as—

Brushwood or faggots (in heaps or in stacks).
Chemical products (in store).
Dredging-boats (with steam-engines).
Eau de Cologne (in casks and in large quantities).
Naval timber-yards.
Ships (building) and boats.
Timber-yards for planks (with workshops).

1st Class.	2nd Class.	3rd Class.	4th Class.	5th Class.	6th Class.	7th Class.
·115.	·125.	·135.	·175.	·275.	·325.	·425.

7th Class comprises—Products and merchandize of a hazardous character, subject to spontaneous ignition, and likely to give rise to fire or explosion, and which are not excluded by law, such as—

Caoutchouc (cloth, &c.).
Corn-ricks.
Resinous gas (not in large quantities).
Silk-worms (in work).
Spirits and brandy (above 24 deg.).
Steam-boats (on the river).
Sulphuric acid.
Turpentine and varnish.
Wadding (in store).

1st Class.	2nd Class.	3rd Class.	4th Class.	5th Class.	6th Class.	7th Class.
·140.	·150.	·175.	·200.	·300.	·350.	·450.

Division II.—*Risks arising from the nature of the Property, together with the risks arising from the trade, combined with the risks arising from the construction of the Buildings.*

This division is classified, like the preceding, into seven distinct classes, comprising the moveable property, the merchan-

dize and materials of the trade, workshops and manufactories, undermentioned.

1st Class comprises—

Baths (keepers of public).
Bookbinders.
Carpenters.
Carriages (persons who let).
Cartwrights.
Chocolate-makers (without steam-engine).
Cook-shops.
Coopers.
Copper-founders.
Curriers.
Druggists.
Dyers (with drying-stove detached).
Dyers and scourers.
Feather-merchants.
Fellmongers.
Gilders (on metal).
Hatters.
Ivory-workers (ordinary).
Joiners (ordinary).
Lace-makers (without steam-engine).
Lithographers and printers (with two presses at most, and without drying-lines).
Lodging-houses, furnished (ground floor).
Metal button-manufactories (without steam-engine).
Packers.
Painters (of houses and coaches).
Paper-makers.
Pastrycooks.
Plumbers.
Porcelain-painters (without furnace).
Rope-makers (without tar).
Saddlers, coach-makers.
Tanners (without mill).
Tin lamp-makers.
Turners.
Turnery warehouses.
Washerwomen (without drying-stove).
Wax-makers.
Weavers (not exceeding five looms).
Woolcombers.

1st Class.	2nd Class.	3rd Class.	4th Class.	5th Class.	6th Class.	7th Class.
·055.	·060.	·070.	·140.	·200.	·250.	·300.

2nd Class comprises—

Bakers.
Basket-makers.
Booksellers (with book-binding establishment).
Carriages, with horses (persons who let).
Carrier-agents.
Colour-merchants.
Confectionary-distillers.
Farriers, blacksmiths.
Furniture-sellers.
Graziers.
Grocers.
Hospitals.
Innkeepers (ordinary).
Knitters.
Liqueur-makers (not distillers).
Packing-case makers.
Pork-shop-keepers.
Post-relays.
Printers.
Public conveyance stations.
Riding-masters (with riding-house).
Seed-merchants.
Wine and spirit dealers (retail).

1st Class.	2nd Class.	3rd Class.	4th Class.	5th Class.	6th Class.	7th Class.
·060.	·065.	·080.	·150.	·225.	·275.	·350.

3rd Class comprises—

Blond and lace (manufactories).
Bronze ornaments (workshops).
Candle manufactories (without melting-furnace).
Dressing cloth, cotton or wool.
Druggists and grocers (wholesale, without laboratory).
Embroidery (workshops).
Florists and feather-dressers.
Fullers.
Glass-works and looking-glass manufactories.
Hosiers (having more than six looms).
Innkeepers receiving carriers.
Metal, sheet-lead.
Needles and pins.
Public baths with apparatus for fumigation, vapour or hot air.
Do. on boats.
Salt-refineries.

Saltpetre-works.
Soap.
Soda and potash.
Steel-refineries, arms (workshops).
Sulphur-refineries.

1st Class.	2nd Class.	3rd Class.	4th Class.	5th Class.	6th Class.	7th Class.
·080.	·090.	·115.	·175.	·250.	·300.	·400.

4th Class comprises—

Bookbinders (with drying lines).
Breweries.
Candle manufactories (with melting-furnace).
Cloth (not spinning) manufactories.
Combing of wool, hemp or flax by machines.
Confectioners (without refinery).
Dressers of cotton, thread or wool (without drying machine, or with one 10 metres apart).
Druggists, wholesale (with laboratory).
Dyers (with dryings, cold or hot, if at least 10 metres distant).
Flax-spinning (but without any of the processes previous to the spinning).
Forges, foundries, &c.
Fulling cloth.
Laundresses (with drying-stove 10 metres apart).
Machinery-makers.
Oil (purifying, and manufactories without mill).
Porcelain, china or pottery-works.
Silk-spinning, with or without steam.
Starch manufactories (without machine).
Stearine candle manufactories (with melting-furnace).
Sulphuric acid (manufactories).
Tile manufactories (separate yards).

1st Class.	2nd Class.	3rd Class.	4th Class.
·110.	·125.	·160.	·200.

5th Class comprises—

Brandy distilleries.
Carriage manufactories.
Coal-gas.
Colours.
Coverlet cotton manufactories (without spinning).
Do. wool do.
Flax-spinning (without any of the processes which precede the spinning).
Glass and looking-glass manufactories (with workshops adjoining the furnace).
Hat (felt, straw and silk) manufactories.
Laundries (with hot drying-stoves less than 10 feet distant).
Liqueur manufactories.
Perfumery manufactories.
Pianoforte manufactories.
Porcelain, china and pottery manufactories (with furnaces heated by coal).
Printed stuffs manufactories.
Printers (with hot drying-stoves).
Tile manufactories (with furnaces heated by coal).
Weaving, thread or cotton (with more than five looms).
White-lead and minium manufactories.

1st Class.	2nd Class.	3rd Class.	4th Class.
·150.	·175.	·200.	·250.

6th Class comprises—

Animal black.
Caoutchouc cloth manufactories.
Combing wool, hemp or flax by the hand.
Dressing of cotton stuffs.
Dyers (with hot drying-stove).
Laundries (with hot drying-stoves).
*Mills for tan or dyeing woods, moved by water or steam.
*Mills (corn) moved by water or steam, with less than six pair of wheels.
*Mills (oil or corn, or for dyeing woods) moved by the wind.

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* These articles are only assured for risks of construction in the three last classes.

Paper manufactories (with drying lines).
Saw-mills moved by water, steam, or other machinery.
Sealing-wax manufactories.
Spinning of wool, combed or unprepared, with steam drying.
Spirit distillers (by steam).
Steam-boat building-yards.
Tile furnaces.
Vermicelli manufactories.

1st Class.	2nd Class.	3rd Class.	4th Class.	5th Class.	6th Class.	7th Class.
·200.	·225.	·250.	·300.	·350.	·400.	·450.

7th Class comprises—

Beetroot-sugar manufactories (with stove, without refinery).
Cotton-spinning (without any of the processes preceding the spinning).
Dyers (hot drying-stove separated).
Mills for corn or dyeing woods, with six pairs of stones.
Paper manufactories (old process).
Saw-mills for ordinary wood and veneers.
Size manufactories.
Spinning of wool (carded).
Spirit distilleries (ordinary process).
Starch manufactories (with machine).
Sugar-refineries (baking and heating by steam).

1st Class.	2nd Class.	4th Class.
·250.	·300.	·450.

Division III.—*Risks of Contiguity.*

By contiguity the risks are increased, when property proposed for assurance is situated in buildings which adjoin others exposed to the dangers provided against in the above classification.

These risks are divided into four classes, corresponding to those of the division for the insurance of buildings, the rates of which are stated under that head.

Risks according to occupation, reserved by the Company.

Their rates are fixed as follows:—

Manufactories.	
Chemical products, inflammable	·600 per cent.
Lamp-black	
Madder	
Resinous gas	
Rope, with pitch and tar	
Turpentine and varnish	
Varnished leather	
Wadding	
Waxed and gummed cloths	

Objects assured.	Warmed by steam. Lighted by		Warmed by ordinary means. Lighted by	
	Gas.	Enclosed lights.	Gas.	Enclosed lights.
Cotton-spinning factories	500	·550	·700	·750
Flax or hemp:				
With all the processes	·750	·800	·900	1·000
Without carding or combing	·600	·650	·700	·800
Without carding or combing, but with other processes	·350	·400	·450	·500
Without any of the above processes, but with spinning-looms only	·250	·300	·350	·400

These rates depend upon the factories and workshops being placed in the 1st Class, according to construction of buildings.

Increase of risks, in regard to the position of objects assured.

In case of goods, materials, or merchandize assured, being situated in a building in which a more dangerous trade is carried on, the rates will be those for the highest risk.

Assurance of the Risks of Tenants.

Art. 1733 of the Code Civil.—The tenant must answer for a fire, unless he can prove that it happened by accident, or by fault of construction, or that the fire has communicated from an adjoining house.

Art. 1734.—If there are several tenants, all are fully responsible for the fire, unless they can prove that the fire commenced in the dwelling part of any one of them, in which case he alone shall be held liable. Or unless some can prove that it was not possible that the fire could commence in their portion of the dwelling, in which case they shall be exempt.

The Society guarantees tenants from the responsibility attached by these two articles—

1. If the building is not assured by the Society, by a premium at the rate of half that required for the building itself.
2. If the building is assured by the Society, at the rate of one-third of the premium during the continuance of the assurance.

Assurance against the indemnification of neighbours.

Art. 1382 of the Code Civil.—The consequences of any act which causes damage to another must be repaired by him through whose fault it has been caused.

Art. 1383.—Every one is responsible for the damage he has caused, not only by his own act, but by his imprudence or negligence.

By the terms of these articles, the proprietor or the tenant, from whose dwelling the fire is communicated, is liable to indemnify his neighbours, who may have suffered loss by the extension of the fire. The Company guarantees the effects of this indemnification for a quarter of the rates demanded for the house assured, or the neighbouring dwelling.

Risks of Explosion of Gas for lighting.

The Society, besides the risks of fire, guarantees against the explosion of gas for an additional premium of,—

·005 per cent. on houses of the 1st or 2nd Class.

·010 per cent. on furniture or merchandize in such houses.

·015 per cent. on furniture and merchandize in the following occupations:—Alabaster (dealers in), jewellers, coffee-house keepers, confectioners, glass dealers, chinamen, watch-makers, instruments of music (dealers in), looking-glass (dealers), objects of art, opticians, perfumers, druggists, porcelain, pictures, glass.

Shop-fronts of all trades.

Workshops and factories.

Marine Risks between London and Dungeness, and between the Thames and the Isle of Wight.

AS it is one of the main objects of the 'Assurance Magazine' to collect and preserve such facts as may hereafter, when further information is obtained, prove useful in drawing general conclusions as to the value of risks of various kinds, either affecting life or property, we gladly avail ourselves of the kind permission of Mr. John Young, a member of the Underwriters' Room, Lloyd's, London, to make use of a list prepared by him of the casualties and wrecks which have been officially reported to have occurred between London and Dungeness. The period over which the reports extend is for eighteen months from January 1849. The loss of life and property recorded is very large. It is impossible however to arrive at the exact result, which is actually much greater than is here stated, from the fact that numerous vessels, *with all on board*, are annually cast away upon the Goodwin and adjacent sands. The result only can be guessed at from certain vessels, which are known to have been in that vicinity, not arriving at their destination after due lapse of time. In using Mr. Young's paper, the facts contained in which have been collected and compiled with great care and attention, we have not thought it necessary to reprint it in the exact form of the original, the principal result to be arrived at being the amount of property which was lost in the time named. The name of the vessel is given in every case in Mr. Young's list, with various other particulars, which may be interesting to underwriters. Sometimes the place where the vessel was driven on shore is stated, and sometimes the nature of the injuries repaired, such as "anchors and chains supplied;" but this information is not of a nature to require further notice for our present purpose. The damages caused by collision, wherever specified, are placed in a separate column. In those cases in which the whole of the necessary documents were not obtainable, the estimated damage is stated; but in forming the average, which from the short period of time under review can only be considered a very rough calculation, we have not deemed it advisable to divide the results.

Table showing the number of Vessels injured and the amount of Damage estimated or incurred in the Navigation between London and Dungeness in each month from January 1849 *to June* 1850 *inclusive, distinguishing the number of Vessels and amount of Damage sustained in Collisions.*

Date.	No. of vessels.	Damage.	No. of vessels.	Estimated damage.	Average damage to each vessel.	No. of vessels.	Damage.	No. of vessels.	Estimated damage.	Average damage to each vessel.	No. of vessels.	Damage.	Average.	Cases of collision or loss, but amount not stated.
1849.		£		£	£		£		£	£		£	£	
Jan.	37	67,352	16	6,855	1,400	3	1739	2	1,130	574	58	77,076	1,329	3
Feb.	4	1,509	...	......	377	...	......	...	......	......	4	1,509	377	2
March	17	6,699	3	570	363	2	394	1	160	184	23	7,823	340	5
April	7	4,087	...	......	584	1	750	...	......	750	8	4,837	605	2
May	1	2,783	...	......	2,783	2	476	...	......	238	3	3,259	1,086	
June	2	20,089	...	......	10,045	...	......	...	......	......	2	20,089	10,045	
July	1	253	...	......	253	...	......	...	......	......	1	253	253	
Aug.	1	169	1	80	99	...	......	...	......	......	2	199	99	1
Sept.	3	1,906	1	520	606	...	......	...	......	......	4	2,426	606	2
Oct.	6	1,354	4	650	200	1	128	...	......	128	11	2,132	194	2
Nov.	4	1,018	...	......	......	2	547	1	70	205	7	1,635	234	1
Dec.	77	30,444	9	12,085	494	2	800	3	35,530	7266	91	78,859	867	13
	160	137,663	34	20,710	816	13	4834	7	36,890	2086	214	200,097	935	31
1850.														
Jan.	22	50,927	3	5,360	2,251	4	331	...	......	83	29	56,618	1,952	17
Feb.	19	50,722	2	220	2,426	2	213	...	......	107	23	51,155	2,224	12
March	4	20,961	...	......	5,240	2	1334	...	......	667	6	22,295	3,716	8
April	2	433	1	250	228	2	404	1	2,000	802	6	3,087	515	5
May	...	....	...	......	......	1	163	...	......	163	1	163	163	7
June	1	77	...	......	77	...	......	...	......	......	1	77	77	3
	48	123,120	6	5,830	2,388	11	2445	1	2,000	370	66	133,395	2,021	52

In examining this table those of our readers who are not accustomed to this class of risks, will probably be surprised at the large amount of property lost in so short a time, and in so narrow a space. In the year 1849 only upwards of £200,000 is the actual or estimated damage to vessels in the passage between London and Dungeness to 214 vessels, and of this amount £41,724 was caused to 20 vessels by collision with others, not to speak of 31 vessels the names of which are recorded, some having been in collision, some run aground, &c., but of which the amount of loss has not been stated. The average damage to each vessel in the year was £935; and of those injured or destroyed by collision £2086. The average however is large in consequence of one or two heavy and entire losses of valuable ships, the "Aberfoyle," in December, being alone estimated at £35,000.

We have given some of the reports, which will explain the more important items of loss. The four months January, February, March, and December of 1849, comprise together 176 vessels out of 214, or 82·2 per cent. of the total vessels injured; and £165,267 out of £200,097, or 82·6 per cent. of the total damage sustained. The first three months of 1850, combined with December of 1849, appear to have been unusually disastrous, no less than £208,927 out of £333,492 being stated as the amount of losses in these four months, when compared with the whole eighteen months observed. The average of the corresponding six months in each year is not so widely different; and perhaps, if similar observations were extended over a longer period of years, some useful and practical conclusions might be drawn from the results.

The following are the reports of particular heavy cases of loss which are deserving of attention, or may help to elucidate the table above given.

1849. Jan. 22nd.—The "Tigris" from Ceylon to London is on shore near Dover, and it is feared will go to pieces. (*Afterwards became a total wreck.*) £57,000.

March 2nd (Whitstable).—"Clementina" from St. Michaels, parted from both anchors and chains on the 28th ult., and was seen on the Maplin, where she shortly after filled and became a wreck. £2,280.

June 7th (Margate).—"Simon Taylor," Jamaica to London, is on shore on the Shingles (became a total wreck). £20,000.

Dec. 8th.—"Potentate," from London to Launceston, in working out of the Downs last evening got on shore on the Main, near Kingsdown, and remains filling with the tide. £8000.

Dec. 9th.—"Digby," from Callao, was on shore yesterday on Pan Sand, with part of cargo thrown overboard and likely to be a wreck. £8200.

Dec. 14th.—"Aberfoyle," Calcutta to London, while at anchor in the Downs last night was run into by a large ship and received so much damage that she was run on shore to prevent her sinking. Estimated £35,000.

Dec. 25th (Dover).—"Columbus," from London to Bombay, went on shore to the eastward of Dungeness Lighthouse, had 10 feet of water in her hold this morning, and it is feared she has bilged.

Dec. 30th (Ramsgate).—A brig has been totally lost this morning. *Crew drowned.*

"Defence," Portsmouth to London, was run into whilst at anchor by the "Ville de Bruges" steamer, and cut down to the water's edge. Crew got on board a steam-tug lying near.

1850. Jan. 5th.—A sunken vessel brig-rigged with all her masts standing was observed yesterday morning, the North Sand Head Light Vessel bearing south, lying right in the track of vessels in 8½ fathoms at low water. She is supposed to have been run down by a steamer during the night of the 4th of January; some of her sails have been saved, marked H. Robilliard, Sailmaker, Jersey. *Crew supposed to have perished.*

Jan. 25th.—"Anna Maria" of South Shields, bound to London, was in contact yesterday morning with the "Ben Nevis" and sunk.

Jan. 26th.—"Palmyra," China to London, was stranded off Boulogne and became a total wreck. £40,000.

Jan. 28th (Deal).—A schooner was observed on the Goodwin Sands this morning, and it is feared *the crew have perished, as she disappeared before the boats reached her.*

Jan. 29th (Dover).—"Stagshaw" for Havanah, went on shore last night near Sandgate and was abandoned; she was got off again this morning after throwing part of her cargo overboard, but sunk again in trying to get into Folkstone.

Feb. 1st (New Romney).—"Glencairn," China to London, is stranded in the East Bay of Dungeness; the hull is under water, and it is feared she will become a wreck. £20,000.

Feb. 4th.—"William and Mary," sunk during the gale of 4th of February at Shoebury Ness. *One boy drowned.*

Feb. 5th.—"Sarah," Jamaica to London, was taken in tow 5th Feb. by steam-tug "Trinity" off Margate Sands, and was obliged to abandon her in the Prince's Channel in consequence of the tow-rope breaking; the steam-tug then brought up at 11 P.M., and it blowing a hurricane lost her anchor and chain. *The Sarah was lost with all on board.*

Feb. 7th.—"Lucinda," from Callao to London, was stranded near St. Valery on the 7th of February, and has become a wreck. £11,500.

March 30th.—"Royal Adelaide," Steam-vessel from Cork to London, was lost on the Tongue Sand *with all on board, supposed 250 souls.*

May 7th, (Ramsgate.)—"Teniers," for Rio de Janeiro, was totally wrecked this morning on the Goodwin Sands, *the mate drowned.* The Captain reports the loss of an English schooner and a French schooner at the same time, *the crews of which are supposed to have perished.*

May 8th (Deal).—"William" and "Henry" from Hull are supposed to have been *totally lost with all on board,* the former on the Mouse, the latter on the Goodwin Sands. (Since confirmed.)

The above is a list of some of the more important accidents which have occurred in the short period of eighteen months. The loss of life and property, great as it appears to be, comprises only a portion of the risks. It will be observed that several cases of the absolute destruction of the vessels, and probably the crews, are recorded, where not even the name of the ship could be ascertained. It is much to be feared that other accidents may occur in the same dangerous locality, the only result known being that the vessels never arrive at their port of destination.

From Mr. Young's paper we also give the following abstract, comprising a period of seven years, from the commencement of 1837 to the end of 1843, of the *loss of shipping and life,* and of the casualties to which vessels are subject in the navigation between the Thames and the Isle of Wight, which was carefully made a few years since from the authentic records of Lloyd's.

From the following it appears that about 23 per cent. of all the vessels incurring damage in the navigation between the Thames and the Isle of Wight were entirely wrecked or foundered; and that rather more than 4 per cent. of the whole number were cases in which the whole or several of the crews and passengers were lost. The proportion of vessels which took the ground but were got off again, was above 40 per cent. The average number of vessels damaged per annum was 196.

	Number of vessels which have lost anchors and cables, were partly dismasted, by bad weather, or being run foul of, or sustained other damage.	Number of vessels which took the ground but were got off again.	Number of vessels entirely wrecked or foundered, of which the crews and passengers were saved.	Vessels totally lost, with all or several of the crews and passengers.	Total.
1837.	48	59	35	12	154
1838.	65	79	29	6	179
1839.	56	80	32	6	174
1840.	96	81	40	8	225
1841.	57	86	42	6	191
1842.	87	77	38	7	209
1843.	90	98	44	11	243
Totals	499	560	260	56	1375
Proportn. per cent.	36·3	40·7	18·9	4·1	100·

In connection with this subject may be examined the results deduced from Mr. Rucker's paper respecting the collisions between vessels, as extracted from Lloyd's list from 1845 to 1849 inclusive, which was published in No. I. Sept. 1850, of this Magazine. The reader will find there stated in a note the number of collisions which occurred in the English and Irish Channels and parts adjacent in 1845 and 1849, as compared with those in all parts reported. We give the proportions to elucidate the frequency of accidents near the shores of England.

Of collisions between vessels there occurred—

	In 1845.		In 1849.	
	Collisions.	Proportion per cent.	Collisions.	Proportion per cent.
In the English and Irish Channels and parts adjacent	164	42·9	142	41·8
the North Sea................	138	36·1	134	39·4
In the Baltic and Mediterranean, including the Categat and Straits of Gibraltar	34	8·9	31	9·1
In other parts	46	12·1	33	9·7
	382	100·0	340	100·0

Thus of the collisions reported at Lloyd's from all parts of the world, the proportion in the English and Irish Channels and parts adjacent, was about 42 or 43 per cent. in each of these years, and it will be noticed how remarkably near the other averages are to each other in each period.

Statement of the Number and Tonnage of Vessels which entered the Port of London with Cargoes from Foreign Ports, or from the Colonies and Dependencies of England during the year 1847.

Countries.	British.		Foreign.	
	Ships.	Tons.	Ships.	Tons.
France	693	88,880	325	23,089
Portugal, Azores, and Madeira	350	36,095	13	1,761
Spain and Canaries	245	24,471	50	5,120
Italian States	127	16,902	45	11,239
Ionian Islands	32	4,136		
Greece	50	7,320	1	210
Moldavia and Wallachia	18	2,716	26	5,186
Turkish dominions	85	14,538	9	2,595
Syria and Palestine	1	136		
Egypt	106	28,652	15	3,330
Tunis, Algeria, and Morocco	12	1,579		
Africa—foreign possessions	4	777	2	756
Asia—foreign possessions	33	12,122	3	1,557
China	62	28,347		
Foreign West Indies	127	34,054	44	9,259
America, United States	84	31,322	180	92,248
———, Central & Southern States	188	50,223	1	2,637
The Whale Fisheries	16	5,306		
From foreign ports. Total	2233	387,576	724	158,987
British Colonies & Dependencies—				
Gibraltar	9	818		
Malta	30	5,461	4	1,027
British Possessions in Africa	214	58,072		
——— Asia	437	209,211	2	914
British North American Colonies	462	205,935	8	2,606
British West Indies	369	111,340		
Channel Islands	503	52,077		
From British Colonies .... Total	2024	642,914	14	4,547
In British vessels	4257	1,030,490	738	163,534
In Foreign vessels	738	163,534		
	4995	1,194,024		
Irish traders	....	108,033		
Coasting trade with London 3010,327—¼th of this	....	752,600		
Total tonnage	....	2,054,657		

It must be particularly observed, that it is not intended here to show the actual value of the risk incurred. The vast trade of England with foreign countries must of course lead to the concourse of both British and Foreign shipping, and the narrowness of the Channels may naturally account for accidents, which neither skill nor carefulness could always avoid. The foregoing table, with which we have been favoured by Mr. Young, will enable some idea to be formed of the number of vessels navigating the Channel with which the casualties in our first table may be compared, making allowance for the increase since 1847, and some proportion for foreign vessels to and from foreign ports, which must be also liable to danger in the passage.

There seems to be a growing opinion that much of the risk to which *life* and *property* are exposed in the short but perilous navigation which forms the subject of this paper, might be avoided by the making the port of arrival and departure some safe harbour on the southern coast. Plymouth or Falmouth have been pointed out by different parties as eligible, but the heavy cost of carriage of goods and passage by railway for so long a land journey, would probably be found to increase too much the cost of merchandise or the expenditure of the poorer class of travellers. The port of Southampton, however, with its capacious docks, ready communication to London by railway, and, if the Directors consult their own interest, as well as that of the public, one would imagine cheap transit of goods on a grand scale, might by its adoption save hundreds of thousands in the mere risk of navigation, which we see to be so fruitful of losses even in the short space of eighteen months. It may be difficult to estimate the amount of British property which is thus annually in peril, because the damage in some cases includes that to foreign vessels passing to and from foreign ports. We believe, however, it is roughly estimated that the average of loss actually incurred to shipping is about $\frac{1}{4}$ per cent. on the amount insured. The £200,000, which is the total reported for 1849, is therefore equivalent to £80,000,000 exposed to risk in the year, and sustaining the damage above stated, on that portion only of the passage between London and Dungeness to other parts beyond. It does not appear from the table we have given what the damages and losses to the same property in other parts of the world may be. Perhaps, in the course of time, we may be able to obtain estimates of losses in other places, and for a longer period. It is probable the subject will grow in interest as the facts are perused, and some of our correspondents may be disposed to favour us with other authentic information.

If to these direct casualties be added the loss of time in the transit of goods, which is always a charge upon the consumer in the price he pays for their consumption, the loss of time to passengers and emigrants, the cost of provisions, the wear of shipping, the wages of seamen and officers, and the expenses of steam-tugs, where time is attempted to be saved, the total is so great, that it has been computed by an authority who has given much labour and experience to the subject, that £500,000 annually are lost to the public by the navigation of the Channel and River to the port of London. The attention. of the Government has been forcibly drawn to the advantages of Southampton for the purposes of emigration. A short line of railway between Willesden and Brentford is all that is wanting to connect the whole narrow gauge lines of the kingdom, and unite the north of England directly with the south. The emigrant and his family would avoid the waste of time, the extra cost of conveyance, and, what is worse, the temptations and dissipation of a great city. He would be carried direct to his place of embarkation, be less subject to the detention by weather of the ship in which he is to embark, find capacious premises ready for his reception during the short time he must necessarily stay (for it is understood the Directors of the Southampton Docks' Company have agreed to prepare one of their warehouses for the comfort and convenience of the emigrants), and would probably in every way discover that both his purse and his time, his comfort and his safety, would be better consulted by avoiding the delays and dangers of the passage by the Thames.

Foreign Intelligence.

AMERICA.—*An Act with respect to Insurances on Lives for the benefit of married women. Passed April 1st,* 1840. The people of the State of New York represented in senate and assembly do enact as follows:—

§ 1. It shall be lawful for any married woman by herself and in her name, or in the name of any third person, with his assent, as her trustee, to cause to be insured for her sole use, the life of her husband for any definite period, or for the term of his natural life; and in case of her surviving her husband, the sum or net amount of the insurance becoming due and payable by the terms of the insurance shall be payable to her to and for her own use, free from the claims of the representatives of her husband, or of any of his creditors; but such exemption shall not apply where the amount of premium annually paid shall exceed 300 dollars (£60).

§ 2. In case of the death of the wife before the decease of her husband, the amount of the insurance may be made payable after her death to her children for their use, and to their guardian if under age.

The American Mutual Life Assurance Company, established 1847.—This institution is authorized by its charter "to issue policies of insurance upon life, and to make all and every insurance appertaining to or connected with life risks, not to exceed $5000 (about £1000), upon the life of any one person, and to grant and purchase annuities. A Guarantee Capital of $50,000 (£10,000) has been well secured, and may by the terms of the charter be increased to $100,000. At the close of each year, the trustees are required to ascertain the amount of *earned premiums* over losses and expenses, and to declare a dividend of the surplus to the members of the Company, for which each is entitled to a certificate, upon which interest is paid annually.

To avoid the difficulties and uncertainties consequent upon taking *notes* for a portion of the annual premium, the rates have been reduced 25 per cent. below the usual charge, and the whole required to be paid in cash annually, semiannually, or quarterly, always however in advance, with interest on each deferred payment. In the event of death, any portion of the annual premium unpaid for that year is deducted from the policy.

The claim is payable 90 days after proof of death.

A certificate of each member's share in the profits is given to him annually, upon which interest is paid. The profit remains in the hands of the trustees till it reaches the sum of $300,000 (£60,000), which is to continue a permanent capital to the Company; after which the surplus profits beyond that amount will be applied yearly to redeem certificates, commencing with those first issued.

The policy provides that the assured may cross and recross the Atlantic Ocean in government or mail steamers, or in first class sailing vessels, during the months of May, June, July and August, and visit any portion of France or of the Islands of Great Britain and Ireland during those months; and may travel by the ordinary modes of conveyance, either by land or water, in or to any part of the United States between the 1st day of November and the last day of June inclusive; and may visit any portion within the settled limits of the two Canadas, Nova Scotia or New Brunswick, at any season of the year. But the insured shall not, without the consent of the Company previously obtained and endorsed upon the policy, visit those parts of the United States which lie south of the southern boundaries of the States of Virginia and Kentucky between the first day of July and the first day of November; nor shall without such consent thus obtained and endorsed thereon, pass beyond the settled limits of the United States as before provided; nor shall without such previous consent obtained and endorsed, enter into any military or naval service, excepting the militia not in actual service.

The policy is void if the insured shall die by his or her own hand, or in consequence of a duel, or by the hands of justice, or in the known violation of any state, national, or provincial law; with the usual stipulations as to the truth of the declaration and the payment of the premiums.

Rates of Premium for £100 for whole Life.*

	Age.				
	20.	30.	40.	50.	60.
Annual premium	1·33	1·78	2·40	3·45	5·25
Premium for one year	·60	·98	1·27	1·49	3·27

In a subsequent portion of the prospectus some observations are made on the system of the Credit plan of paying the premiums, regulated on the principle of one-fourth being paid in cash, and three-fourths in the promissory notes of the assured, the notes drawing interest at the rate of 6 per cent. per annum. Assuming a case at the age of 35, and the expectation by the Carlisle Table, it is pointed out that the average annual payments for $5000 during the expectation would be $127·14, or $24·14 more than the equal payments required by this Company, whilst the accumulated premium notes to be deducted from the claim would leave only $1707·06, instead of the $5000.

The following extract from a letter printed in the 'Gazette of the Union,' Jan. 1st, 1848, will give some idea of the reduction of premium allowed by some of the American companies:—"In one Company they state in one of their annual reports 'that on the 31st Jan. 1848 the probable profit then to be apportioned (being for five years' business) among the Members would be from 70 to 80 per cent. on the amount of premiums paid by them;' that in another Mutual Company, 'no profits were credited for any sum less than 10 dollars, nor for the fractional parts of sums between even tens of dollars, but that all such fractional parts of sums, and sums less than ten dollars, were placed to the contingent account of the Company;' that in others the credit system was adopted for premiums, in some 40 per cent., some 50 per cent., and in others 75 per cent. of the premiums were received in notes of the assured, which necessarily must be an uncertain reliance for the payment of losses; the least evil of which system is less security and more expensive management."

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* The rates for the whole continuance of life are nearly 10 per cent. below those deduced from the "Experience of offices," without any addition for expenses of management, &c.—*Ed.*

New York Life Insurance and Trust Company. Incorporated 9th March, 1830. *Answer and Report,* 1848.

1st Jan. 1848.		£
Amount of capital loaned out on bond and mortgage . .		200,000
Amount of loans on bond and mortgage not included in loans on capital, and other than loans to monied corporations, or to their officers or agent		337,405
Amount of loans on stock securities, other than loans to monied corporations, or to their officers or agents . .		238,154
Amount of loans on bonds, bills, or notes, with personal security only		9,918
Amount due from persons on account, being a balance in the hands of Magniac and Co.		3,347
Amount of interest accrued due and payable on loans, including interest on stocks owned by the Company . . .		13,289
Amount due from banks and other monied corporations .		9
Amount of stocks owned by the Company		102,200
Amount of cost of a lot and building owned by the Company in Wall St.		16,997
Amount on foreclosure of mortgages on real estate unsold	16,059	
Ditto contracted to be sold for	13,411	
		29,470
Amount of money on hand, balance in the bank of the State of New York		12,223
Amount of furniture of office		80
Amount of securities taken for monies received to be invested at the risk and for the benefit of the persons from whom such monies were received		7,792
		£970,884

1st Jan. 1848.	£
Capital stock of the Company held by 184 Stockholders	200,000
Amount of money by order of the Court of Chancery, or of Surrogates, to be invested or kept at the risk of the Company . . .	198,361
Amount of accumulation on £31,491 deposited in trust for accumulation (part of above)	3,281
Amount of deposits in trust by other persons and companies, other than monied corporations	447,321
Amount of accumulation on £24,063 (part of above)	5,548
Amount of interest which had accrued become due and payable on the deposits in trust, other than trusts of accumulation . . .	16,542
Amount for which the Company was liable as guardians of the estate of infants	9,024
Amount of interest due on ditto	356
	£880,433

	£
Due to the Company as receiver, for which they hold ample security	4,493
During 1847 there had been among individuals insured 7 ascertained deaths, altogether for	3,490

The number of lives insured on 1 Jan. 1848, was 580. The youngest of the lives insured in the office is aged 18 years, and according to the tables hitherto used by the Company, has a right to live 42·87 years. The oldest life is 73 years, and has a right by the same tables to expect to live 7·72 years (Carlisle Table).

	£
The amount of premiums received last year for the insurance of lives was	12,062
The amount of sums assured	405,644
The amount of annuities due by the Company	89
The amount received for the granting of 31 annuities	11,988
The amount of annuities paid by the Company annually	1,374
The amount of dividends unpaid 1st Jan. 1848	245
The amount of trust-money in hand for investment	788
The amount of life assurance policy due and unpaid	1,000

The Company have declared two dividends on the capital stock of the Company during the past year, one in February and one in August 1847, of 3½ per cent. each.

Balance Sheet of the Company, 1st Jan. 1848.

Dr.	£	Cr.	£	£
Capital	200,000	Bonds and Mortgages	541,155	
Deposits in trust	590,128	Deduct for depreciation	2,420	
Trusts of accumulation	55,554			538,735
Life insurance	45,315	Bills receivable and stock loans	242,322	
Annuity granted	15,780	Deduct for depreciation	13	
Premium account	1,621			242,309
Unclaimed dividends	245	State Stocks, cost		107,504
Guardianship account	9,024	Real estate, cost	46,467	
Contingent account	805	Deduct for depreciation	1,813	
				44,654
Due by the Company for interest on deposits	16,542	Country banks		9
Due by the Company for trusts of accumulation	10,153	Insurance account, bond and mortgage		1,232
		Receivership account		4,493
Due by the Company for guardianship account	356	Magniac, Jardine and Co.		3,347
		Insurance expenses		894
		Suspense account		4
	945,523	Cash in bank		12,223
Surplus of Profits, 31 Dec. 1847	25,100	Total interest calculated as due and accrued on various accounts		15,289
	£970,623			£970,623

Canada Life Assurance Company, Hamilton. Established 1847. *Capital* £50,000.—*First Annual Report read at General Meeting, 1st August* 1848. The first policy issued bears date 29th October 1847, from which period until 1st June 1848, 144 policies were issued, assuring the sum of £59,650, creating a revenue from premiums of £1650 6*s*. 10*d*.; of these, 136, covering £55,650, have been taken up and are now in force.

The receipts to the 1st June 1848 have been—

	£	*s*.	*d*.
Deposit of £1 per cent. on the stock	500	0	0
First premiums on 136 policies taken up	1548	12	8
For policy fees, fines, and sea risks	39	0	0
Interest on investments	50	11	7
Entrance fees on half-credit system	15	0	0
	£2153	4	3

While the payments for the current expenses amounted to £380 8*s*. 11*d*., leaving a balance of £1772 15*s*. 4*d*., of which £740 8*s*. is invested in Bank Stock, and £587 8*s*. 11*d*. secured upon such policies as have been taken up by quarterly and half-yearly payments.

No single risk exceeding £1000 has been accepted, while the average amount of the present risks is £431 10*s*.

The President, Mr. Hugh C. Baker, in replying to a vote of thanks, remarked in reference to Dr. Hamilton's allusion to the cause of the loss of a charter in the Legislative Council, which the latter gentleman had been informed by a member of the Legislative Assembly was for want of a subscribed capital, explained that the Charter had not been applied for on the part of this Company, though many of those now present had been among the petitioners. It was proposed at that period to establish a Society under the name of the 'Canada Mutual Life Assurance Society,' and in refusing the Bill, the members of the Council were probably not aware that the mutual principle, though at first apparently unsafe, had been long and successfully established in Great Britain and in some of the United States of America.

Balance Sheet of the affairs of the Canada Life Assurance Company on the 1st June 1848.

Dr.	£	s.	d.	Cr.	£	s.	d.
Cash in bank of Montreal	240	6	5	Stock for 1 per cent. on £50,000 paid in	500	0	0
Cash in agent's hands	193	17	0	Proprietors' account for profits	81	14	7
Investments, viz.—				Mutual branch, of which £147 5*s*. 5*d*. is profit	813	1	7
In bank stocks	740	8	0	Assurances	362	19	2
On policies	587	8	11	Entrance fees	15	0	0
Office furniture	10	15	0				
	£1772	15	4		£1772	15	4

Hamilton, 1*st Aug*. 1848.

HUGH C. BAKER, *President*.

Statistics of the Assured.

Professions, Trades, and Occupations.

Merchants	21	Students of divinity	4
Tradesmen	23	Civil engineers	3
Mechanics	9	Judge of the District Court	1
Bank agents	5	Sheriff	1
Barristers	13	Farmers	3
Clergymen	4	Land agents	5
Physicians	3	Other occupations	9
Clerks in banks and other offices	28		
Clerks in government and public offices	12		144

Place of Nativity.		*Ages.*	
England	56	19 to 25	13
Scotland	33	26 to 30	40
Canada 22, New Brunswick 1	23	31 to 35	35
Ireland	17	36 to 40	22
United States of America	9	41 to 45	19
France 2, Guernsey, Ionian Islands, Jamaica, and Portuga 1 each	6	46 and upwards	15
	144		144

BELGIUM.—*Belgian Company for General Assurances against the risks of Fire, established at Brussels.—Report to the Shareholders* 16*th April* 1850, *of the operations of the Company from* 1*st Jan. to* 31*st Dec.* 1849.

Total Assurances.

	£
Sums insured on 31st December 1848	37,213,315
,, during the year 1849	11,752,849
Total	48,966,164
Deduct for polices expired, cancelled, &c.	9,306,046
	£39,660,118

Profit and Loss Account.

Cr.	£	£	£
Premiums for assurance	50,223		
Deduct for re-assurances	9,631		
		40,592	
Charge for policies, &c.		202	
Interest account		2,510	
			43,304
Dr.			
Losses and expenses consequent thereon		22,152	
Commission, discounts, and payments on re-assurances		8,056	
Interest paid to Shareholders		1,693	
Medals, &c. distributed in 1849		56	
Remuneration of the Agent-General		296	
Attendance fees of the Directors		243	
Official salaries		1,871	
Postage, parcels, office expenses, &c.		899	
Printing and publishing		183	
Patent rights		95	
Rent of the Company's offices for half a year		48	
Various expenses		15	
			35,607
Net profit			£7,697

	£	£
Of which was added to the reserved fund	1697	
Dividend amongst the Shareholders on 2000 Shares at £3 per share	6000	
		7697

The sum allotted to each share of £85 for Interest, Dividend and proportion of Reserve, is £4 14*s*.

	£
Reserved capital on 31st December 1849	26,129
Part of profit added to reserve	1,697
Total 31st December 1849	£27,826

Bruxelles, 10*th April* 1850.

Certified by ZANNA, *Inspector.*
DINDAL, *President.*
Comte J. A. COGHEN, *General Manager.*

GERMANY.—*Berlin.*—*Die Berlinische Feuer Versicherungs Anstalt in Berlin.* The Berlin Fire Insurance Company was established in Berlin in 1812, after the model of the London Phœnix, with a share capital of £121,430. On the 1st Jan. 1844 the sums insured amounted to very nearly £2,571,430, and the receipts of premiums had reached £8015, which latter, on the 1st Jan. 1847, had increased to £9901, with a surplus profit of £6071.

Thirty-eighth Balance Sheet of the Berlin Fire Insurance Company on 31st December 1850.

Received.	£	£	£
For Premiums carried over from former years			8,144
For losses by fire unsettled at the date of the last account	850		
And	3236		
		4086	
Of which the amount paid in 1850		2303	
		1783	
And reserved for losses not yet paid to be hereafter accounted for		1659	
Remains a surplus to be now brought to account of			124
Premiums for the year after deduction of reassurance premiums		8823	
Less commission and discount		642	
			8,181
Interest received		2287	
Deduct interest on the amount of £28·6 per share, or on £24,286, at 4 per cent.*	971		
For Commission	1		
		972	
			1,315
			£17,764

Payments.	£	£
For losses by fire paid in the year 1850, deducting the proportion for re-assurances	14,326	
Ditto, not yet paid	922	
	15,248	
For expenses, gratuities, and salaries	1,204	
For business tax for the year 1850	17	
Premiums carried over for the year 1851	9,118	
		25,588
Loss in the year 1850		£ 7,824

In the books of the Company the value of the shares at the close of the year 1850, including £114 of instalments still unpaid, would be about £173, besides a proportion of the reserve premiums of £9118.

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* It appears from this item that the capital of the Company is divided into 850 shares of 1000 rixthalers each (£143 each), and that 20 per cent., or £28·6, is paid up on each share. The shares are represented to be at a premium of about 21 per cent.

Since printing the preceding reports, we have received from Herr Rath, G. Hopf of Gotha, the following interesting particulars of the present position of some other of the leading Fire and Life Assurance Companies of Germany. We beg to draw the attention of our readers to the statement, as it is to Herr Hopf that we are indebted for the full and excellent reports of the Gotha Life Assurance Company, which enabled us to give in our first Number a *resumé* of the operations of the Company for twenty years, and which also furnished a large portion of the materials for Mr. Neison's valuable 'Essay on the Mortality of the Provident Classes in this Country and on the Continent,' read before the British Association for the Advancement of Science, and recently printed in the Statistical Journal. We shall be able, however, in our next Number, to give more full and recent accounts of the progress of some of these Companies.

State of the most distinguished Fire Insurance Companies in Germany on the 31*st December* 1849.

Established.	Name of Company.	Sums assured.	Annual premiums.
	Mutual Company.	£	£
1821.	Gotha Fire Insurance Company ……	49,087,414	160,326
	Proprietary Companies.		
1819.	Leipsic Fire Assurance Company……	17,143,000	
1822.	Elberfeld ditto ……………………	18,661,517	32,300
1825.	Aachen-Munchen ditto……………	68,861,698	128,802
1839.	Colonia ditto ………………………	46,931,194	89,387
1844.	Magdeburg ditto …………………	9,230,150	32,609
	Transport during the year ……	42,240,376	
1847.	Silesia ditto (at Breslau) ……………	3,794,929	17,329
	Fire …………	213,709,902	460,753
	Transport……	42,240,376	

Statement of the Progress and Position of some of the principal Life Assurance Companies of Germany at the close of the year 1848 *or* 1849.

Established.	Name of Company.	Year.	Assurances existing at the beginning of the year.		New Assurances during the year.		Assurances existing at the end of the year.		Premiums and interest received during the year.	Claims paid.		Expenses of Management.		Funds.			Capital.	
			Persons.	Sums assured.	Persons.	Sums assured.	Persons.	Sums assured.		No. of persons.	Sums.	Absolute.	Percent. of receipts.	In general.	Reserve for value of policies, &c,	Surplus.	Nominal.	Paid up.
				£		£		£	£		£	£		£	£	£	£	£
1829.	Gotha Life	1849	15,036	3,430,171	1011	232,829	15,471	3,517,014	158,370	324	80,893	6748	4·25	817,528	661,158	135,600	Mutual	Mutual
,,	Lubeck Life	,,	Unkn.	421,585	Unkn.	36,590	Unkn.	426,125	20,447	44	11,705	1867	9·13	68,403	Unkn.	5,381	72,857	7,286
1831.	Leipsic Life	,,	4,390	748,243	254	38,014	4,418	744,300	33,170	119	21,729	1914	5·80	149,047	185,728	6,504	Mutual	Mutual
,,	Hanover Life......	1849—50	2,761	214,143	pol. 122	12,814	pol. 2802	225,857	7,352	45	5,071	497	6·80	30,283	Unfixed	....	Mutual	Mutual
1834.	Trieste Life	1849	Unkn.	419,143	Unkn.	Unkn.	Unkn.	451,060	25,036	Unkn.	Unkn.	Unkn.	Unkn.	45,993	Unkn.	9,176	The capital for the fire branch.	
1836.	Berlin Life.........	,,	6,474	1,085,629	465	78,967	6,619	1,110,157	54,882	166	26,686	3392	6·20	186,187	145,975	44,498	142,857	28,571
,,	Munchen Life ...	,,	1,082	123,853	132	12,596	1,111	125,208	Unkn.	27	3,233	Unkn.	Unkn.	18,023	Unkn.	Unkn.	The capital for the Hypotheken bank.	
1840.	Vienna Life	1848	1,687	140,803	93	9,025	1,696	138,468	5,981	Unkn.	3,722	761	12·70	14,795	Unkn.	Unkn.	Mutual	Mutual
1842.	Brunswick Life...	1849	437	33,829	65	4,243	496	37,371	1,175	5	400	Unkn.	Unkn.	3,607	Unkn.	Unkn.	Mutual	Mutual
1845.	Frankfort Life ...	1848	Unkn.	Unkn.	Unkn.	Unkn.	Unkn.	75,202	3,778	7	2,122	582	15·40	18,967	Unkn.	Unkn.	244,898	24,490
1846.	Hammonia Life at Hamburg...	,,	Unkn.	56,514	165	18,914	Unkn.	64,257	3,439	Unkn.	Unkn.	Unkn.	Unkn.	2,817	1,450	....	Mutual	Mutual
1848.	Janus Life, at do.	1849	300	49,756	1013	138,951	1,181	164,002	7,562	9	2,321	1444	19·10	8,766	Unkn.	Unkn.	71,429	7,143

AUSTRIA.—*K. K. priv. Erste Osterreichische Gesellschaft.*

Statement of the Accounts of the Imperial privileged First Austrian Fire Insurance Company for the year 1850.

Fire Insurances.	Sums assured.	Gross Premiums.	Re-assurance.	Commission.	Losses, deducting re-assurances.	Rewards and expenses attending Fires.	General expenses of management.	Total.	Profit.	Loss.
	£	£							£	£
In the kingdom of Hungary and parts adjacent	2,280,975	10,276	592	585	8,065	521	465	10,228	48	
In Bohemia	3,017,819	9,751	970	280	3,560	488	391	5,689	4,062	
In Gallicia	1,130,113	7,738	1080	282	5,657	441	376	7,837	....	99
In Italy	11,767,328	3,856	66	388	1,831	167	149	2,601	1,257	
In the Archduchy of Austria, above and below the Enns	4,941,495	12,159	2420	368	4,767	555	432	8,542	3,617	
In the Margraviate of Moravia and Imperial Silesia	1,426,400	5,227	853	185	5,686	289	258	7,271	....	2,044
In the Duchy of Steyermark, Carinthia, and Kram	542,620	1,030	25	26	225	60	32	368	663	
Foreign States	5,945,426	10,118	263	1041	6,406	552	542	8,803	1,315	
	31,052,175	60,158	6269	3155	36,197	3073	2643	51,338	10,962	2,143
							Deduct loss		2,143	
							Leaving net profit		8,819	

Other Assurances.	Sums assured.	Gross Premiums.	Commission and discount.	Losses.	Expenses connected with losses and agents.	General expenses of management.	Total.	
	£	£	£		£	£	£	
For land carriage	4,043,312	1,885	83	258	....	104	445	1,441
River and sea risks	2,066,939	8,890	929	4558	767	471	6725	2,165
Hail insurance	148,637	4,502	450	389	117	247	1204	3,298
Total	6,258,888	15,277	1462	5205	884	822	8374	
After deducting 5 per cent. on the capital there remained profit on its use								232
Together								15,954
Deducting the income tax £179, and the bonuses paid according to the law								1,252
Total profit for the year 1850								14,702

Signed V. HASLINGER, *General Secretary*.

RUSSIA.—*St. Petersburg, Sept.* 2, 1847. The Emperor has just issued a ukase which forbids the insurance in foreign countries of real property situated in Russia, under pain of a fine of 3 per cent. on the sum insured. The same ukase places a tax of ¾ per cent. on the amount of every policy of insurance against fire made in Russia. The proceeds of this tax are destined to contribute to defray the expenses of the administration of police in the locality in which the object insured may be situated. (TIMES, *Sept.* 16th, 1847.)

Die Russiche Gesellschaft zur Versicherung von Capitalien und Revenuen.

Accounts of the Russian Company for the Assurance of Sums and Annuities for the year 1849. (*Silver rouble*=3s. 2d. *nearly*.)

Received from the 1st Jan. to 31st Dec. 1849—		£
Premiums in Branch A		30,397
„ „ B		203
Sums in Branch C		1,382
for recruit branch		846
Premiums in Branch D		257
		33,090
Interest from Bank Bills and the funds		13,350
		46,440
From which deduct—	£	
Total salaries of officers and expenses of agents at St. Petersburg, Moscow, Riga, and Kiew	2,087	
Allowance for agents in different towns, and for the Directors	1,801	
Claims paid and allowed in Branch A	12,726	
Surrendered policies £9117 in Branch A	1,111	
„ „ £462 in Branch D	24	
Surrendered pension in recruiting branch	3	
Annuities paid in Branch C	1,276	
		19,028
Balance		27,412
Of this sum—		
Dividend paid to the Shareholders	13,860	
Carried to the reserved fund	13,192	
		27,412

Report of the Year 1849.

From the 1st January to 31st December 1849, there were new assurances in Branch A, 174 persons.

		£
Of whom for the whole continuance of life	149 for	73,479
„ seven years	20 for	9,596
„ one year	5 for	834
Total	174 for	83,909

Of these assurances the amounts were—

2 for £3160	1 for £2370	6 for £1580
2 for £1372	3 for £1056	4 for £948
12 for £790	15 for £632	40 for £474

And the rest for smaller sums.

According to occupations, there were—

		£
64	Merchants and tradesmen assured for	34,340
77	Clergymen, professional men, and civil service, for	30,649
19	Of the nobility and military for	9,693
14	Females for	9,227
		£83,909

According to residence—

			£
59	persons in	St. Petersburg	44,193
9	„	Finland	3,141
59	„	the East Sea Provinces	12,766
7	„	in Moscow	7,764
40	„	in other Russian towns	16,045
			£83,909

Of these there were assured—

		£	
In Branch	B 1 person with	47	annuity.
„	C 6 „	126	„
„	D 2 children	74	sums.
„	C 365 recruits	423	annuity.

	£
Paid and reserved in this year for 28 deaths	12,726
Forfeited, surrendered, and expired policies, 93 for	45,111

Of which the deaths in branch C were	2	persons for	£ 20 annuity.
„ surrendered and forfeited in D	2	„	821 sums assured.
„ „ in recruit branch	1	„	2 annuity.
„ forfeited in Branch B	1	„	15 „

The total of all the assurances since October 1835, has amounted to—
In Branch A 2379 persons, for the total sum assured of £1,292,017.

Under different ages the number and amounts assured have been—

			£
15 to 20 years	29	persons for	6,373
21 to 25 „	122	„	36,391
26 to 30 „	335	„	139,268
31 to 35 „	461	„	239,067
36 to 40 „	464	„	254,702
41 to 45 „	368	„	230,850
46 to 50 „	287	„	191,474
51 to 55 „	180	„	120,036
56 to 60 „	114	„	68,555
Above 60 „	19	„	5,301
	2379		£1,292,017

The average age of all persons assured in Branch A. is 39½ years.

			£	
Assurances	in Branch	B 24 persons for	946	annuity.
„	„	C 84 „	2648	„
„	„	D 68 „	9196	sums.
„	„	C 5115 recruits for	5994	annuity.

After deduction since that time of 222 persons whose policies had become claims for £113,902, as well as the assurances which were not renewed, were surrendered or lapsed, there were remaining still in force at the end of 1849 the following assurances.

In Branch A. 1534 persons for £838,436.

Of whom there were assured—

		£		£
24 persons for				3160
23 „	from	3000	to	2370
92 „	from	2212	to	1580
248 „	from	1422	to	790
904 „	from	632	to	158

And 243 persons for smaller sums.

In Branch B 18 persons for . . .	734	annuities.
„ G 59 „ . . .	1660	„
„ D 40 children for . . .	5325	„
„ C 5111 recruits for . .	5989	„

*Table of Annual Premiums for the Assurance of £100, payable at death**.

Age.	Premium.	Age.	Premium.	Age.	Premium.
15	1·94	31	2·76	47	4·14
16	2·00	32	2·82	48	4·26
17	2·04	33	2·86	49	4·38
18	2·10	34	2·94	50	4·54
19	2·16	35	3·00	51	4·70
20	2·20	36	3·08	52	4·86
21	2·24	37	3·14	53	4·98
22	2·28	38	3·26	54	5·14
23	2·32	39	3·32	55	5·32
24	2·36	40	3·40	56	5·50
25	2·40	41	3·48	57	5·70
26	2·46	42	3·60	58	5·92
27	2·50	43	3·68	59.	6·14
28	2·56	44	3·80	60	6·38
29	2·62	45	3·90		
30	2·68	46	4·00		

Balance Sheet on 1*st Jan.* 1850.

			£		£
In the Commercial bank—				Capital of the Company—	
Bank Stock for....................			69,520	Paid by the Shareholders on 20,000 shares=£632,000	180,572
In the funds—	£			Reserve Fund	105,332
5 per cents......	182,650			Claims due but unpaid	4,094
6 per cents......	4,424			Dividends standing over from 1836 to 1848............................	207
4 per cents......	31,126	Cost ..	219,380	Dividends for 1849	14,220
	£218,200				
Interest—					
On Bank Stock and the funds......			7,600		
Cash in hand......................			808		
Advances on policies			6,924		
In Agents' hands....................			193		
			£304,425		£304,425

Signed by the Directors.
Genl. Adjutant Graf. W. ADLERBERG.
Genl. Adjutant W. PEROFFSKY.
MATTHEW CARR.
ANTON GATSCHOW.
ROBERT CATTLEY.

General Manager, G. TH. SCHULTZE.
Accountant, ERNST EBEL.

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* This table is nearly the same as the Northampton rates at all ages.—ED.

TRIESTE,—*K.K. priv. Riunione Adriatica di Sicurtà in Trieste* (*the Imperial privileged Adriatic Assurance Company*). The Company was established in the year 1838, and insures against damage by fire (even when occasioned by lightning) buildings and moveable property of all kinds. Goods may be also insured against accidents in the course of transport, whether by land or water.

The Company possesses a capital stock of £200,000, and according to the last report there existed on the 30th June 1850—

	£
Reserve fund	18,591
Premium reserve	90,688
Besides an annual income from Premiums of about	120,000

In the course of the year then closed, the Company had settled losses amounting to £65,127, and from the beginning of its operations to the end of 1850, a total sum of £654,041.

The Report for the twelfth financial year, from the 1st July 1849 to 30th June 1850, states that the total premiums received in the course of the year amounts in round numbers to £114,000, on the total sums insured of £25,900,000. When compared with former years, this result shows the important addition of £37,300 to the premiums, and an increase of £6,600,000 in the sums insured.

The losses which the Company have had to pay in the year do not exceed the fair proportion of the risks which have been run. In number they have been 2087 for a total sum of £65,127, which, after making allowance for the amount of re-insurances, is reduced to £51,560.

The premium reserve, which has been increased in proportion to the great increase in the existing insurances, now amounts to £90,689.

After deduction of the per-centage for the reserved fund, there remains on the business of the twelfth financial year, a clear profit of £5,272.

	£	
The reserve fund consists of	90,689	premiums.
. . . . . .	18,591	annual accumulations.
Forming together an available fund of .	£109,280	

Statement of the Accounts for the 12*th Financial Year, from* 1*st July* 1849 *to* 30*th June* 1850.

	£	£	£
Premiums brought forward from the last account for insurances still in force			75,727
Amount reserved in last account for losses not yet settled			2,800
Premiums for insurances on property of all kinds, as well as goods in transport, against loss by fire and other elements, making a total insured in Trieste and the different agencies together of £25,964,950			114,017
Profit on the purchase and sale of stocks		2,118	
Less interest on the reserved fund		650	
			1,468
Total . . .			194,012

	£	£	£
From which deduct—			
For Premiums on insurances still in in force, clear of the commission, bonuses and re-assurances			90,689
Remaining			103,323
From this deduct further—			
Total amount of losses which have fallen upon the Company by 2084 insurances, after deducting the salvage received	65,127		
Less the proportion borne by re-assurances	13,567		
		51,560	
Amount of losses experienced in this year not yet settled		3,100	
Reinsurance premiums on £4,479,416		16,337	
Discount, bonuses, and brokerage upon all the insurances		7,234	
Commission to agents on premiums received from them		10,926	
Salaries, rent, postage, printing, travelling expenses, &c. in Trieste, and agencies		6,118	
Interest for shares		59	
			95,335
Gross surplus			7,988
From which deduct further—			
20 per cent carried to the reserved fund		1,598	
Remuneration to Directors		1,118	
			2,716
Leaving a net surplus of £			5,272

Which being divided amongst 1977 shares at present partaking, gives to each £2 13*s*.

	£
Reserve fund by last account	16,263
To which are now to be added—	
Interest thereon	650
Profit on shares given up	80
Reserve from surplus of the present account	1,598
Total reserve fund 30th June 1850=	18,591

Trieste, 19th December 1850. Signed, ALEX. DANINOS,
General Secretary.

MISCELLANEA.

Sir William Petty's Essay on the "Growth of the City of London."—The essays in political arithmetic by this writer contain at the same time many wild speculations, and many striking views of general politics, very much in advance of the age in which he wrote. He was amongst the earliest writers who drew any practical attention to the question of population. The "Essay concerning the Multiplication of Mankind," together with another "Essay in Political Arithmetic concerning the Growth of the City of London, with the Measures, Periods, Causes, and Consequences thereof, 1682," appears to be deficient in the essay on the first part of the subject, but the substance and scope of it is given as contained in a letter from Sir William to a friend, and is quoted here for the purpose of showing the strange mixture of useful and speculative notions which distinguish his works.

"The scope of this essay is concerning people and colonies, and to make way for another essay concerning the growth of the city of London. I desire in the first essay to give the world some light concerning the numbers of people in England, with Wales, and in Ireland; as also of the number of houses and families, wherein they live, and of acres they occupy.

2. How many live upon their lands; how many upon their personal estates and commèrce, and how many upon art and labour; how many upon alms; how many upon offices and public employments, and how many as cheats and thieves; how many are impotents, children, and decrepid old men.

3. How many upon the poll taxes in England do pay extraordinary rates and how many at the level.

4. How many men and women are prolific, and how many of each are married or unmarried.

5. What the value of people are in England, and what in Ireland, at a medium, both as members of the church or commonwealth, or as slaves or servants to one another; with a method how to estimate the same in any other country or colony.

6. How to compute the value of land in colonies in comparison to England and Ireland.

7. How 10,000 people in a colony may be, and planted to the best advantage.

8. A conjecture in what number of years England and Ireland may be fully peopled, as also all America; and lastly, the whole habitable earth.

9. What spot of the earth's globe were fittest for a general and universal emporium, whereby all the people thereof may best enjoy one another's labours and commodities.

10. Whether the speedy peopling of the earth would make—

1st. For the good of mankind.
2nd. To fulfil the revealed will of God.
3rd. To what prince or state the same would be most advantageous.

11. An exhortation to all thinking men to solve the Scriptures, and other good histories concerning the number of people in all ages of the world, in the great cities thereof and elsewhere.

12. An appendix concerning the different number of sea-fish and wild fowl at the end of every thousand years since Noah's flood.

13. An hypothesis of the use of those spaces (about 8000 miles through) within the globe of our earth, supposing a shell of 150 miles thick.

14. What may be the meaning of glorified bodies in case the place of the blessed shall be without the convex of the orb of the fixed stars, if that the whole system of the world were made for the use of our earth's men.

The principal points of this discourse—

1. That London doubles in 40 years, and all England in 360 years.

2. That there be anno 1682, about 670,000 souls in London, and about 7,400,000 in all England and Wales, and about 28,000,000 of acres of profitable land.

3. That the periods of doubling the people are found to be in all degrees from between 10 to 1200 years.

4. That the growth of London must stop of itself before the year 1800.

5. A Table helping to understand the Scriptures concerning the number of people mentioned in them.

6. That the world will be fully peopled within the next 2000 years.

7. Twelve ways whereby to try any proposal pretended for the public good.

8. How the city of London may be made (morally speaking) invincible.

9. An help to uniformity in religion.

10. That it is possible to increase mankind by generation four times more than at present."

In a subsequent part Sir W. Petty examines what would be the comparative effect of London being seven times bigger than he then reckoned, and the inhabitants 4,690,000 people, and seven times less and the inhabitants only 96,000. To the objection that many cannot conceive the former possible, he answers—"First, as to practicable, we say that although our said extravagant proposals are both in nature possible, yet it is not obvious to every man to conceive how London, now seven times bigger than in the beginning of queen Elizabeth's reign, should be seven times bigger than now it is, and forty-nine times bigger than anno 1560. To which I say,—1. That the present city of London stands upon less than 2500 acres of ground, wherefore a city seven times as large may stand upon 10,700 acres, which is about equivalent to a circle of 4½ miles in diameter, and less than 15 miles in circumference. 2. That a circle of ground of 35 miles semidiameter will bear corn, garden stuff, fruits, hay, and timber, for the 4,690,000 inhabitants of the said city and circle, so as nothing of that kind need be brought from above 35 miles distance from the said city; for the number of acres within the said circle, reckoning 2 acres sufficient to furnish bread, drink, and corn, for every head, and 2 acres will furnish hay for every necessary horse; and that the trees which may grow in the hedgerows of the fields within the said circle may furnish timber for 600,000 houses. 3. That all live cattle and great animals can bring themselves to the said city; and that fish can be brought from the Land's End and Berwick as easily as now. 4. Of coals, there is no doubt; and for water 20*s*. per family (or £600,000 per annum in the whole) will serve this city, especially with the help of the New River. But if by practical be understood that the present state may be suddenly changed into either of the two above mentioned proposals, I think it is not practicable. Wherefore the true question is, unto or towards which of the said two extravagant states it is best to bend the present state by degrees; viz. whether it be best to lessen or enlarge the present city? In order whereunto we inquire (as to the first question) which state is most defensible against foreign powers, saying that if the above mentioned housing, and a border of ground of three quarters of a mile broad, were encompassed with a wall and ditch of 20 miles about (as strong as any in Europe, which would cost but a million, or about a penny in a shilling of the house rent for one year), what foreign prince could be able to bring an army from beyond sea able to beat—1. Our sea forces, and next with horse harassed at sea, to resist all the fresh horse that England could make, and then conquer above a million of men, well united and disciplined, and guarded within such a wall, distant everywhere three quarters of a mile from the housing, to elude the granadoes and great shot of the enemy? 2. As to intestine parties and factions, I suppose that 4,690,000 people united within this great city, could easily govern half the said number scattered without it, and that a few men in arms within the said city and wall could also easily govern the rest unarmed, or armed in such a manner as the sovereign shall think fit. 3. As to uniformity in religion, I conceive that if St. Martin's parish may (as it doth) consist of about 400,000 souls, that this great city also may as well be made but as one parish, with seven times 130 chapels, in which might not only be an uniformity of Common Prayer, but in preaching also; for that a thousand copies of one judiciously and authentically composed sermon, might be every week read in each of the said chapels, without any subsequent repetition of the same, as in the case of homilies; whereas in England (wherein are near 10,000 parishes, in each of which upon Sundays, Holidays, and other extraordinary occasions, there should be about 100 sermons per annum in the whole) it were a miracle, if a million of sermons, composed by so many men, and of so many minds and methods, should produce uniformity upon the discomposed understandings of about eight millions of hearers. 4. As to the administration of justice:—If in this great city shall dwell the owners of all the lands and other valuable things in England; if within it shall be all the traders, and all the courts, offices, records, juries, and witnesses; then it follows that justice may be done with speed and ease. 5. As to the equality and easy levying of taxes. It is too certain that London hath at some times paid nearly half the excise of England; and that the people pay thrice as much for the hearths in London as those in the country, in proportion to the people of each, and that the charges of collecting these duties have been about a sixth part of the duty itself. Now in this great city, the excise alone, according to the present laws, would not only be double to the whole kingdom, but also more equal. And the duty of hearths of the said city would exceed the present proceeds of the whole kingdom. And as for the customs, we mention them not at present. 6. Whether more would be gained by foreign commerce. The gain which England makes by lead, coals, the freight of shipping, &c., may be the same, for aught I see, in both cases. But the gain which is made by manufactures will be greater, as the manufacture itself is greater and better. For in so vast a city, manufactures will beget one another, and each manufacture will be divided into as many parts as possible, whereby the work of each artisan will be simple and easy; as for example, in the making of a watch, if one man shall make the wheels, another the spring, another shall engrave the dial-plate, and another shall make the cases, then the watch will be better and cheaper than if the whole work be put upon one man. And we also see that in towns, and in the streets of a great town, where all the inhabitants are almost of one trade, the commodity peculiar to those places is made better and cheaper than elsewhere. Moreover, when all sorts of manufactures are made in one place, there every ship that goeth forth can suddenly have its loading of so many several particulars and species as the port whereunto she is bound can take off. Again, when the several manufactures are made in one place, and shipped off in another, the carriage, postage and travelling charges will enhance the price of such manufacture, and lessen the gain upon foreign commerce. And lastly, when the imported goods are spent in the port itself where they are landed, the carriage of the same into other places will create no surcharge upon such commodity; all which such particulars tend to the greater gain by foreign commerce. 7. As for arts of delight and ornament. They are best promoted by the greatest number of emulators; and it is more likely that one ingenious curious man may rather be found out of 4,000,000 than 400 persons. But as for husbandry, viz. tillage and pasturage, I see no reason but the second state (when each family is charged with the culture of about 24 acres) will best promote the same. 8. As for lessening the fatigue of carriage and travelling. The thing speaks itself; for if all the men of business and all the artisans do live within five miles of each other, and if those who live without the great city do spend only such commodities as grow where they live, then the charge of carriage and travelling could be little. 9. As to the preventing of beggars and thieves. I do not find how the difference of the said two states should make much difference in this particular; for impotents (which are but one in about six hundred) ought to be maintained by the rest; 2nd, those who are unable to work, through the evil education of their parents, ought (for aught I know) to be maintained by their nearest kindred, as a just punishment upon them; 3rd, and those who cannot find work (though able and willing to perform it) by reason of the unequal application of hands to lands, ought to be provided for by the magistrate and landlord till that can be done; for there need be no beggars in countries where there are many acres of unimproved improvable land to every head, as there are in England. As for thieves, they are for the most part begotten from the same cause; for it is against nature that any man should venture his life, limb or liberty for a wretched livelihood, whereas moderate labour will produce a better. But of this see Sir Thomas More in the first part of his Utopia. 10. As to the propagation and improvement of useful learning. The same may be said concerning it as was above said of manufactures and the arts of delight and ornaments; for in the great vast city there can be no so odd a conceit or design whereunto some assistance may not be found, which in the thin scattered way of habitation may not be. 11. As for the increase of people by generation. I see no great difference from either of the two states, for the same may be hindered or promoted in either from the same causes. 12. As to the plague. It is to be remembered that one time with another a plague happeneth in London once in twenty years, or thereabouts; for in the last 100 years, between the years 1582 and 1682, there have been five great plagues, viz. 1592, 1603, 1625, 1636 and 1665. And it is also to be remembered, that the plagues of London do commonly kill one-fifth part of the inhabitants. Now if the whole people of England do double but in 360 years, then the annual increase of the same is but 20,000, and in twenty years 400,000. But if in the city of London there should be 2,000,000 of people (as there will be about sixty years hence), then the plague killing one-fifth of them, viz. 400,000, once in twenty years, will destroy as many in one year as the whole nation can refurnish in twenty; and consequently the people of the nation shall never increase. But if the people of London shall be above 4,000,000 (as in the first of our extravagant suppositions is premised), then the people of the whole nation shall lessen above 20,000 per annum. So as if people be worth £70 per head (as has elsewhere been shown), then the said greatness of the city will be a damage to itself and the whole nation of £1,400,000 per annum, and so *pro ratâ* for a greater or less number; wherefore to determine which of the two states is best (that is to say, towards which of the two states authority should bend the present state), a just balance ought to be made between the disadvantages from the plague with the advantages accruing from the other particulars above mentioned; unto which balance a more exact account of the people and a better rule for the measure of its growth is necessary than what we have here given, or are yet able to lay down."

Curious Speculation of Sir William Petty on the Number of People at the Resurrection.—It was not very pertinent to a discourse concerning the city of London to thrust in considerations of the time when the whole world will be fully peopled, and how to justify the Scriptures concerning the number of people mentioned in them, and concerning the number of the quick and the dead who may rise at the last day, &c. Nevertheless, since some friends, liking the said digressions and impertinences (perhaps as sauce to a dry discourse), have desired that the same might be explained and made out, I therefore say as followeth:—

1. If the number of acres in the habitable part of the earth be under 50,000,000,000; if 20,000,000,000 of people are more than the said acres will feed (few or no countries being so fully peopled); and for that in six doublings (which will be in 2000 years) the present 320,000,000 will exceed the said 20,000,000,000.

2. That the number of all those who have died since the Flood is the sum of all the products made by multiplying the number of the doubling periods mentioned in the first column of the last table by the number of people respectively affixed to them in the third column of the same table, the same sum being divided by 40 (one dying out of forty per annum out of the whole mass of mankind), which quotient is 12,570,000,000; whereunto may be added for those who died before the Flood enough to make the last-mentioned number 20,000,000,000 as the full number of all who died from the beginning of the world to the year 1682; unto which, if 32,000,000, the number of those who are now alive, be added, the total of the quick and the dead will amount to but one-fifth part of the graves which the surface of Ireland will afford without ever putting two bodies into any one grave, for there be in Ireland

28,000 square English miles, each whereof will afford about 4,000,000 of graves; and consequently above 114,000,000,000 of graves, viz. about five times the number of the quick and the dead which should arise at the last day in case the same had been in the year 1682.

3. Now if there may be place for five times as many graves in Ireland as are sufficient for all that ever died, and if the earth of one grave weigh five times as much as the body interred therein, then a turf less than a foot thick pared off from a fifth part of the surface of Ireland will be equivalent in bulk and weight to all the bodies that ever were buried, and may serve as well for that purpose as the two mountains afore-mentioned in the body of this discourse. From all which it is plain how madly they were mistaken who did so petulantly vilify what the Holy Scriptures have delivered.

Instances of Longevity.—In a work published in 1799 by James Easton, entitled 'Human Longevity,' recording the name, age, place of residence and year of the decease of 1712 persons, who attained a century and upwards from A.D. 66 to 1799, comprising a period of 1733 years, with anecdotes of the most remarkable, occur some of such remarkable longevity as to be beyond belief. It is wise in our author, that having, as he says in his preface, refused admittance to every account of the authenticity of which he had the smallest doubt, he has confined the following extraordinary account to a separate place in the preface:—

Numas de Cugna. Maffeus, a Portuguese author, who wrote 'The History of the Indies,' which has always been a *model of veracity*, as well as elegant composition, mentions a man of the name of *Numas de Cugna*, a native of Bengal, who died in the year 1566 at the incredible age of 370 years. "He was a person of great simplicity, and quite illiterate, but of so extensive a memory that he was a kind of living chronicle, relating distinctly and exactly what had happened within his knowledge in the compass of his very long life, together with all the circumstances attending it. He had four new sets of teeth, and the colour of his hair and beard had been very frequently changed from black to gray and from gray to black. He asserted that in the course of his life he had 700 wives, some of whom died, and the others he had put away. The first century of his life passed in idolatry, from which he was converted to Mahomedanism, which he continued to profess to his death." This account is also confirmed by another Portuguese author, Ferdinand Lopez Castegueda, who was Historiographer Royal.

Peter Torton. Died in 1724, aged 185. Of Temeswar in Hungary; a peasant. The remarkable longevity of this man exceeds the age of Isaac five years; of Abraham, ten; falls short of Terah's, Abraham's father, twenty; and exceeds that of Nahor, Abraham's grandfather, thirty-seven.

John Rovin. Died in 1741, age 172; *his wife*, age 164. Of the Bannat of Temeswar in Hungary. Both died in the same year, in the 148th year of their marriage, leaving two sons and two daughters, besides many grandchildren. Their youngest son was 116 years of age.

The Countess of Desmond. Died in 1612, age 145. Of Ireland. She was married in the reign of King Edward IV., was in England the same reign, and danced with the Duke of York, the king's brother. Upon the ruin of the house of Desmond, she was obliged, at the great age of 140, to travel from Bristol to London to solicit relief from the court, being reduced to poverty. Lord Bacon says she renewed her teeth twice or thrice. This remarkable lady was a subject for the pens of a variety of authors. She retained her vigour to the last.

Easton has given a table of the general summary of the facts collected in his volume, and compared them with Haller's enumeration of 1111 instances for all ages above 100. A table of mortality, formed from the former and corrected, will be found in Babbage's 'Comparative View,' &c. Mr. Babbage observes,—"About the ages marked by round numbers, &c., as 110, 120 and

130, there appeared to be more deaths than the proper allowance; but the most singular, and which deserves notice from its not being explicable on the same principle, was the large number which occurred at the age of 102, both amongst females and males, but particularly amongst the latter." The following is the summary of original facts, considered authentic, but, it is probable, unintentionally incorrect, from the difficulty of procuring or preserving evidence of age at such advanced periods of life:—

Ages.	Died.	
	Haller's Table.	Easton's Table.
100 to 110......	1000	1310
110 to 120......	60	277
120 to 130......	29	84
130 to 140......	15	26
140 to 150......	6	7
150 to 160......	1	3
160 to 170......		2
170 and upwards		3
	1111	1712

CORRESPONDENCE.

To the Editor of the Assurance Magazine.

London, April 14, 1851.

Sir,—I am desirous, through the medium of your eminently useful Magazine, to give publicity to the existence of a Society recently formed, which bids fair to furnish information of much value in a department of medical knowledge hitherto greatly neglected. This Society has for its object the investigation of Epidemics—a class of diseases which has from time to time proved more fatal to the human race than any other, or perhaps than all the other classes put together. The Epidemiological Society is chiefly, but not exclusively, composed of medical men, laymen being also admitted to unite in a cause which is of equal interest and importance to all mankind.

The methods by which the Society pursues its inquiries are, *first*, by holding periodical meetings, at which papers are read and discussed; *secondly*, by forming committees for investigating particular subjects; *thirdly*, by encouraging and aiding experimental researches in chemistry, meteorology and other sciences, upon such points as bear upon epidemic diseases, and seem likely to throw light upon their origin; *fourthly*, by supplying a library, apparatus and other facilities for those engaged in such inquiries.

The objects of the Society, as above stated, will be perceived to be of great importance as respects life insurance, as well because they tend, by improving our knowledge of the causes of disease, to enable us to avoid them, and thus to increase the probabilities of life, as because they will furnish medical men with surer data on which to estimate its value. It is hoped, therefore, that Insurance Companies, bearing in mind the duty they have to perform to the public as well as to themselves, will not refuse to become contributors either by donation or annual subscription to the funds of so useful an institution.

I have the honour to be, Sir, your obedient Servant,

B. G. BABINGTON, M.D.

REVIEWS OF NEW WORKS.

On the Mortality of Master Mariners. By F. G. P. Neison, Esq.

[Read before the Statistical Society of London, 18th June, 1849.]

The inquiries of Mr. Neison have tended to throw light upon so many obscure topics connected with the assurance of life and health, that we willingly draw attention to one of these original investigations, hoping, in future Numbers, to notice other subjects to which his labours have been so honourably and usefully applied. Though a little reversing the order of his observations, we must begin by cordially expressing our assent to his remarks on the small aid which has been furnished in the collection of original facts by the number of wealthy and flourishing companies, possessing ample means not only of aiding individual researches, but of contributing data of the most important and genuine character. We firmly believe, that not only the public, but the Companies also, gain by the knowledge of the laws which regulate any class of contingencies. There can scarcely be a more striking proof of this fact than the immense impetus which has been given in this country to the assurance of life, by the subject having been inquired into and the laws investigated by men of science and competent experience; nor, on the other hand, of the distress and failures which occur for want of such data, than the deplorable condition in which the large mass of Benefit Clubs, designed for provision against sickness and infirmity, are at this moment placed. The actual experience of Life Assurance Companies is even yet scarcely known. Only two Societies, the Equitable and the Amicable, have given the results to their members in a form which is available for scientific inquiries; for the "Experience of Seventeen Life Assurance Companies" must be considered deficient in several important particulars, especially in the short duration of observation amongst the members. How little encouragement has been given to researches which would tend to the general benefit of all, as, for instance, the collection of data from various quarters, of the Statistics of Disease, and risks of residence in Foreign Climates! Mr. Neison observes,—

> "It is notorious, that notwithstanding many Societies have at command a greater capital than some of the governments of Europe, there is not a single public document extant throwing light on the state and condition of any other class in the community than their own members, published at the expense of those Societies. Of the very meagre quantity of information which does exist, all has been derived from other sources; and there is no wonder, therefore, that in these wealthy corporations there should exist the anomalous feature, unknown to other matters of enterprise and industry, of the practice being much in advance of the science on which it should be founded; in fact, after the most diligent inquiries, a single instance has not been found of any one of these great and powerful companies, which boast of their millions of invested capital, having spent £500 in the original investigation of any single branch or department of Vital Statistics."

It may be probably objected to Mr. Neison's censure, that the capitals of these companies belongs to others, and that the managers cannot use them merely for the advancement of knowledge in general. The funds of these companies are no doubt held in trust for specified purposes; but if the subject of inquiry be one in which the interests of the members, as an associated body, are concerned, it may not be unreasonable to expect that a portion of them may be devoted to scientific inquiries by which the risks may be more accurately ascertained and the true premiums be more closely computed. We shall probably have occasion to renew this subject in our next Number, in reference to a scientific Society recently formed amongst the Medical Profession, for investigations in which Life Assurance Companies are largely concerned, and now proceed to a few remarks on Mr. Neison's paper.

The materials for his article have been collected from the records of the "Master Mariners' Society," enrolled under the Friendly Societies' Acts, and they include the experience of the Society for fourteen years, from 1835 to 1848. The members consist exclusively of master mariners, and, previous to admission, they are subject to the same scrutiny as to health and habits as is customary on entering a Life Assurance Society. In addition to the usual experience of friendly societies, the benefits granted allow of some curious investigations peculiar to the class, sums of money being not only paid on the deaths of members, but in case of the wreck or partial wreck of their vessels. By reclassifying the facts in different forms, Mr. Neison shows, in Table I., that out of 270 deaths, which occurred amongst the total number of 11,146 persons, exposed to the risk of mortality, 165 deaths only have taken place from natural causes, 62 were lost with their vessels, 7 took place by violent means (such as falling of masts and loss of life in engagements with pirates), 23 were drowned, 12 washed overboard, and 1 hung himself. From other abstracts, it appears, that while from all causes 270 deaths happened in the Master Mariners' Society, the corresponding members, according to the rate of mortality in England and Wales, as given in Mr. Neison's 'Contributions to Vital Statistics,' would be 145, being an increase of mortality of upwards of 86 per cent., or 90 per cent. if the ages 21 to 60 only be taken. Again, considering only the deaths by natural causes in this class, 165 occurred instead of 144, according to the rate of mortality in England and Wales; being an excess of 14½ per cent., or 18 per cent., between the ages 21 and 60 inclusive.

A singular abstract is also given, showing the number of wrecks, total and partial, which occurred to members of the Society at different ages, descending gradually from 3·95 per cent. between the ages 21–25 to 1·342 per cent. between ages 61–65, with the exception of the ages 51–55, at which the proportion of wrecks is the highest of all, viz. 4·114 per cent. Mr. Neison remarks,—

> "It will thus be seen, that at the younger ages the wrecks and losses of property, under the charge of master mariners, is greater than at the more advanced ages; and these facts, viewed in connection with the circumstance already alluded to, that the loss of life from accidental and extraordinary events is also more frequent at younger ages, strengthen the presumption that increased years and experience among the captains of merchant vessels give greater security to both life and property under their charge."

Mr. Neison has taken the trouble to compute, and had the liberality to publish D and N columns at 3 per cent. interest, deduced from a corrected table of results, so that the actuary may have at his command the means of calculating with great facility all the money values for annuities and assurances in this class of occupation. An interesting comparison is also made between the mortality amongst master mariners and that deduced from the returns of mariners' friendly societies generally throughout the kingdom, embracing a humbler class of seafaring men than the former. The deaths out of 32,509 exposed to risk are given as 830, and the proportion per cent. is 2·55, as compared with 2·43 by the former table, showing a slight difference in favour of the master mariners.

However much the subject of Statistics may be derided by a few writers, who prefer a more flighty and less plodding way to knowledge, there can be little doubt that it is only by the collection of actual facts that the community will ever derive permanent safety or advantage in the application of the doctrines of probability. Brilliant speculations may give their authors temporary fame, and dazzle the public eye with their useless splendour, but the real good of the humbler classes of society is more effectually consulted by these quiet endeavours to search for facts, by which the institutions founded for their benefit may be set on a firmer basis and be more deserving of success. We think this paper reflects credit on the author, both for its practical utility and the public spirit with which it is written.

General Average and the Losses and Expenses resulting from General Average Acts, practically considered. By Laurence R. Baily. London: Baily Brothers, 1851, pp. 124.

The etymon of the mercantile word *Average* has been planted from language to language till it is reduced to a Scythian word meaning *spring grass.* The newer and simpler derivation is, however, from the Latin verb *averare,* to carry or bear; and *average,* or more properly *general average,* signifies, in commerce, that *bearing* of certain losses among many, which were incurred for the general benefit of that many. In other words, it relates to the contribution between the shipowners and the proprietors of cargo in a marine adventure, to make good some loss sustained or some expenses incurred by one or more of the associated parties for the salvation or the benefit of the whole of the interests at stake.

The arrangement of settlements of this kind,—and they are susceptible of great variations and considerable intricacy,—forms a branch of distributive justice, and gives rise to a distinct mercantile profession. The writer of the present small volume belongs to this profession, and is therefore entitled to attempt to reduce in categorical form the various heads of the subject; and he produces a hand-book for the use of those whose misfortune may lead them to study a system which has its life and origin in *loss.* Larger and more learned works have indeed preceded Mr. Baily's, which in a considerable degree must be looked upon as a repetition of or a selection from them. Park, Abbott, Hughes, Arnould, Stevens, and others, have devoted treatises in part or in whole to *Average.* Mr. Baily takes up one division of the subject only, and he treats of it in a series of propositions, with occasional discussions and illustrations. With the object of being curt he often runs the risk of being considered dogmatic, and of sometimes following his own notions of what should be rather than of what is done. But it must be admitted that the system, if it may be called one, is difficult to deal with; for it lies on a neutral ground between law and custom, written and unwritten. It is indeed based on common principles of equity; but so many conflicting interests are concerned, that in attempting to work it out concessions are often to be made from what is abstractedly just to what is practically expedient: and the very principle which we fully assent to in general, when applied to every instance, will be found occasionally to lead us only to a dilemma. Thus no two men of those who practise the profession of Average Adjusting will be found to agree on every point; and any series of rules drawn up by one of them will be rather his particular view than containing the assent of all the prevailing customs and modes of thinking even of different parts of the same country, —the tendency in some minds towards legal guidance, and in others to the shorter and easier method of common usages, will produce considerable inflexions and variety in drawing up codes of rules relating to the same system. Perhaps there is no way of harmonising conflicting doctrines and establishing uniformity in practice except the institution of a central chamber of commerce, a tribunal invested with a quasi-legal authority, which should be empowered to decide on all points and to bind all parties.

In the absence of such a tribunal, Mr. Baily's book, without being considered as the type of actual accuracy, will be found an useful addition to the literature of the subject, as reducing to a short summary most of the cases and forms of General Average. It might indeed, practically speaking, have been rendered even more useful had it been divested of a certain formal style of expression, bordering on pedantry, considering the really diverse and conflicting nature of some of the best opinions still current on the subject. Faults of style are not indeed of very vital importance, except when they hinder an author's meaning from being seen; and a little emendation before a second edition will make Mr. Baily's really useful little book more readily intelligible, and therefore a better exponent of the author's own views than in its present state it can hope to be. That the subject is an important one is universally acknowledged, and it will therefore be as obviously admitted it is worthy of all the care that competent persons like Mr. Baily can bestow upon it, until by degrees it shall be so fashioned and made conformable to certain leading principles that it may eventually really have that pretension to artistic form which Mr. Baily, in common with others, has had rather to wish that it had, than to be able to aver that it at present has, however consistent each Average adjuster may consider himself in his own practice, individually considered.

Want of space obliges us to defer our intended notice of Mr. Edwin Farren's work on 'Life-Contingency Tables,' No. I.

We have received the following works:—

Report upon the Fund for a Provision for the Widows and Children of the Ministers of the Church, &c. of Scotland. By Wm. Thos. Thomson, F.R.S.E., F.I.A.

Essay on the Mortality of the Provident Classes in this Country and on the Continent. By F. G. P. Neison, Esq.

Observations on Odd Fellow and Friendly Societies. By F. G. P. Neison, Esq.

Single and Annual Assurance Premiums for every Value of Annuity on Single or Joint Lives or Survivors, &c. By William Orchard, A.I.A.

Assurance and Annuity Tables, according to the Carlisle rate of Mortality at 3 per Cent. By Peter Gray, F.R.A.S., Henry Ambrose Smith, F.I.A., and William Orchard, F.I.A.;

Some of which we hope to notice in our next Number.

REPORTS OF ASSURANCE COMPANIES.

Medical, Invalid, and General Life Assurance Society.—At the annual meeting held in 1848, the first division of profits was made, by which nearly 2 per cent. per annum was added to those policies participating in the profits of the Society.

At the annual meeting held on the 29th November 1849, it was stated that 475 policies had been issued during the last year, covering assurances to the amount of £201,712, and yielding annual premiums amounting to £7496.

Abstract showing the Number and Amount of Policies issued in each year, ending 30th September, since the commencement of the Society.

Year.	New Policies.	Amount assured.	Annual Premiums.		
		£	£	s.	d.
1842.	130	55,245	1,882	13	7
1843.	208	87,831	4,992	18	6
1844.	197	80,415	4,120	4	3
1845.	258	103,015	5,563	17	0
1846.	199	83,701	4,985	8	5
1847.	313	113,542	4,537	3	4
1848.	412	124,459	4,980	2	8
1849.	475	201,713	7,496	0	6
Total...	2192	849,921	38,258	7	11

Palladium Life Assurance Society.—Twenty-fifth Annual Meeting held April 1850. The Report contained the following comparative statement of the increase in the business of the Society:—

	1845.			1849.		
	£	s.	d.	£	s.	d.
Balance of assets	272,159	6	0	312,161	9	0
Gross amount of premiums received	28,776	6	9	38,100	1	11
New premiums	1,960	1	0	5,722	10	4
Sums assured by new policies	52,898	0	0	153,666	0	0
Ratio of charges to capital	1	8	0	1	4	6

In accordance with the desire expressed at the last General Meeting, the Directors had ordered the accounts to be printed, and recommended that they should be circulated.

Capital and Assurance Account.

Dr.	£	s.	d.	£	s.	d.
Paid up capital	59,956	0	0			
Additions, making the capitalized value of each share £2 4*s.* 2*d.*	6,323	15	6			
				66,279	15	5
Reserved fund				7,569	4	11
Provision for outstanding risk on assurances, subject to periodical re-valuation				237,252	0	4
Dividends due				1,060	8	4
				£312,161	9	0

Cr.	£	s.	d.
Mortgage investments	201,868	13	8
Government securities	36,036	18	5
Reversions and annuity investments	29,161	12	7
Advances on policies and bonds	13,956	0	3
Bank Stock, Palladium Stock, and India Transfer Loan	21,555	13	10
Estimated value of houses and fixtures	4,601	5	0
Amount of debit at Agents	3,717	1	8
Policy stamps in hand	17	0	0
Cash at London and Westminster Bank	1,247	3	7
	£312,161	9	0

We have examined the above account, and find it correct.

J. B. East,
W. E. Gilpin, } *Auditors.*

Transactions of the Year 1849.

Dr.	*Receipts.*		£	s.	d.
Jan. 1.	Balance of assets from previous year		296,432	9	3
Dec. 31.	Premiums on new policies issued in 1849	5,722*l.* 10*s.* 4*d.*			
	Ditto on renewals	32,377*l.* 11*s.* 7*d.*			
			38,100	1	11
	Commissions on re-assurances		120	17	5
	Interest		11,630	16	8
	Proceeds of re-assurances cancelled		818	13	4
	Profit on sale of 3 per cent. Reduced		16	11	9
	Transfer fines		7	2	6
			£347,126	12	10

Cr.	*Payments.*	£	s.	d.
Dec. 31.	Claims paid in the course of the year	22,579	7	8
	Returns on surrenders of policies	1,869	9	3
	Premiums on re-assurances	2,319	17	1
	Charges, including agencies and medical reports	3,826	3	6
	Commission	1,381	3	8
	Proprietors' Dividends	2,978	7	8
	Policy stamps	10	15	0
	Balance (Assets) invested in Government Stock, Mortgages, and other securities	312,161	9	0
		£347,126	12	10

	£	s.	d.
Amount assured 31st December 1849	1,132,171	5	2
„ „ 1848	1,058,143	16	1
Increase in 1849	£ 74,027	9	1

	£	s.	d.
Balance of Assets, 1849	312,161	9	0
„ 1848	296,432	9	3
Increase in 1849	£15,728	19	9

March 21, 1850. J. LODGE, *Secretary.*

Professional Life Assurance Society.—Third Annual General Meeting held April 1850. The Report states that the list of proprietors now exceeds 1200 in number. The number of names added to the Deed of Settlement in the year 1847, was 73; the number of shares appropriated 7450. In the year 1848, 140 names were added, and 4035 shares distributed. In 1849 the accession of names was 1036, with an issue of 24,550 shares; while from the 1st January last to the present time, 272 names have been subscribed to the Deed, and 2515 shares allotted. Thus the entire number of 40,000 shares, constituting the capital of the Company, have been almost wholly absorbed.

The number of policies effected in the year 1847 was 69, yielding premiums to the amount of £579 9*s.* 2*d.* In 1848 the number of policies issued was 161; the amount of premiums received £1850 10*s.* 1*d.* In 1849, the number of policies completed was 293, the income from premiums £3553 4*s.* 8*d.*; while from the 1st January last, 82 policies have been granted, creating an annual revenue from new premiums of upwards of £1000. The total income of the Company at the present time derived from premiums, after deducting assurances lapsed by death and other causes, amounts to upwards of £5300; the total number of policies issued is 605, and the amount assured £178,380.

On reference to the balance sheet to the 31st December last, the losses by deaths, owing to the prevailing epidemic of the past year, will be found to exceed the usual average. The total losses by deaths from the commencement of the Company amount to £3972 19*s.* 11*d.*

A dividend after the rate of 5 per cent. per annum (free of income tax), was declared on the paid-up capital of the Company to 31st December last.

Provident Clerks' Mutual Life Assurance Association.—Meeting held at Liverpool, Nov. 1849. The Chairman of the Company gave a short account of what they had done since they commenced in 1840. Up to the 30th September 1849 they had issued 313 policies, and during the last month, October, 76 policies were issued, for assuring £18,350. This was much more than they did in the whole year 1843. Up to the 31st October they had issued 389 policies for £81,020; whereas in the preceding year they had only issued up to the same time 349, for £68,960. The present annual income from premiums was upwards of £11,000.

In the benevolent department they had now 14 permanent annuitants, 3 aged clerks of £25 per annum, and 11 widows of £15 per annum. They had granted 65 loans during the year, to the amount of £1167; gratuities had been given to 9 distressed members, to the amount of £65, and the total number of loans granted was 318, to the amount of £6288.

In Liverpool they had something like 100 members, with £30,000 assured. A gratuity had been granted to 1 clerk; £246 had been granted in loans to members, and 4 claims had been paid here, amounting to £650.

A meeting was held January 1850 for the purpose of altering some of the rules. The qualification of managers was raised from a life assurance of £300, to one of £500, and they were empowered to raise the amount of assurances that might be granted from £1000 to £2000. The fines on account of arrears were reduced one half.

Reliance Mutual Life Assurance Society.—General Meeting January 1850. Second allocation of profits. The Report contains a statement of the progress of the Society since the last division of profits on 31st December 1846, which took place after 5 years, all subsequent divisions of profit being triennial.

The premium receipts for 1849 were £8290 9*s*. 9*d*. The new business of the year consists of 124 policies, for sums from £25 to £3000, upon which the premium receipt has been £1866 11*s*. 10*d*.; 35 proposals for £27,100 have been declined or not proceeded with, and 16 proposals remained for further consideration, of which 10 have been since completed, adding £223 17*s*. 8*d*. to the premium fund.

No claims have occurred, although the number of lives, including new assurances, at risk through the year, have been nearly 400. Upon the policies in force on the 1st January, the ratio of the probable mortality gave a sum of £2273 for the claims that might have been expected in the year, whilst none have occurred. Since the last distribution of profits the Society has paid £2200 in claims, against a calculated risk for the 3 years of £5593. To cover this difference and make provision for changes of an adverse fluctuation of mortality, the Directors propose to set apart £4000, previous to striking the balance for the present declaration of profits.

From the balance sheet annexed to the Report, it appeared that the funds in hand and invested amounted to £22,116; and that the premiums on policies in force, valued as annuities, give a sum of £108,865, against the value of the liabilities calculated as reversions, which yield a total of £101,865. This includes however in the valuation, the margin of unrealized profit provided for in the premium calculations; the amount of profit in expectancy that would by the above process be made to appear as present profit is no less than £25,686. In the balance sheet the value of the unrealized margin is added to the liabilities, for deduction from the actual and computed assets, and leaves a balance of £8875 17*s*. 8*d*. as the amount of realized profits. The portion of this balance appertaining to the assurance fund is £8534 15*s*. 1*d*. Deducting the sum of £4000 as reserve, previously explained, and one-third of the clear surplus to be retained as a rest, according to the provisions of the Deed, there remains £3023 3*s*. 5*d*. to be declared as divisible, giving, as on the last allocation, a bonus of 75 per cent. of the office margin above described. Such bonus may be applied either in the reduction of premium or addition to the sum assured.

The Directors have set apart for the expenses of the Society 20 per cent. of the premium receipts, by which the charges of the last 3 years have been fully met, and the preliminary expenses also reduced by the sum of £841.

Reliance Mutual Life Assurance Society.—Ordinary Annual Meeting for election of Directors and for general purposes, held on Tuesday, July 30, 1850. The accounts of the Society for the past half year state that the premium receipts for the last 6 months amounted to £4294 13*s*. 9*d*., making with those of the previous half year an aggregate of £8749 17*s*. 9*d*., of which £2010 7*d*. represents the new business effected during the year in respect to 123 policies assuring £45,795, whilst 35 proposals for sums amounting to £23,000 have been declined, or have not been proceeded with on the terms required by the Society. To this source of income is to be added the receipt of interest for the year, which, including fines on loans, has been £1122 13*s*. 1*d*.

There has been only one claim on death during the half year for the sum of £200. The number of lapsed policies from non-payment of renewal premiums was 9, for sums amounting to £3400, on which £112 18*s*. had been received.

After the distribution of a second bonus, of which a considerable portion has already been paid in reduction of current premiums, or in liquidation of sums due to the Society as forborne half premiums, the balance of improved premium receipts for the year over all outgoings for the same period amounts to £5930 12*s*. 11*d*., increasing the general fund of the Society to £29,820 9*s*. 6*d*.

A modification of the rule established at the first division of profits, by which the mode of taking the bonus was limited to that elected in each case at the first participation of profits, was carried, to the effect that "it shall be lawful for the Directors at any future distribution of profits, in any case which may not seem to them disadvantageous to the Society, to allow a change of mode in the application of any subsequent bonus upon the same policy."

Royal Insurance Company.—Annual General Meeting, August 1850. The Directors in the Report refer briefly to the separate branches of the Company's business.

1. *Fire branch.*—The amount of premiums received for the year 1849 is £34,469 10*s*. 4*d*., exceeding that of any other year since the Company was established. During the first six months of the present year the fire premiums amount to £19,747 12*s*. 3*d*., exhibiting an increase of no less than 25 per cent. on the corresponding months of last year. The claims for the last six months have somewhat exceeded the amount of losses for any similar period since the commencement of business. Nevertheless the profit accruing for the same period has been £9000.

2. *Life branch.*—The annual amount of premiums received in this department (which so recently as the year ending June 1846 only reached £1574) has been for the past year £7044 11*s*. 2*d*., while it is expected that for the present year the sum of the premiums will be between £8000 and £9000.

One life has dropped during the past year; and since its close small claims have become payable on 2 others. The deaths in five years have been but 4; whilst a computation founded on the mortality amongst assured lives would have given 10.

The Report for the year 1848 stated, that after the adoption of the plan proposed of capitalizing £89,280, and paying a dividend of 2*s*. per share, there would remain but the sum of £10,433 14*s*. 11*d*. as a re-assurance fund to meet any possible emergency; but no adverse circumstances having taken place, the accounts show an amount to the credit of profit and loss of £27,809 17*s*. 1*d*. as the result of the business for 1849. The Directors therefore propose a dividend of 3*s*. per share to be declared for the year, being 5 per cent. on the accumulated capital of the Society, equal to 7½ per cent. on the £2 originally paid up by the shareholders only five years since. The payment of this dividend will absorb £13,512, leaving £14,297 17*s*. 1*d*. of the above surplus to be carried to the credit of the re-assurance fund. The balance of that account will then be £24,731 12*s*. 1*d*., which will be kept apart to meet claims of any unusual magnitude.

Royal Farmers' Insurance Company. Balance Sheet for the Year ending 25th March, 1849.

Dr.	£	*s.*	*d.*
To Deposit on shares	45,596	0	0
Call of 10*s.* per share	16,439	0	0
Amount due to solicitors	1,800	0	0
Unsettled fire losses	1,244	6	0
Unsettled life losses	600	0	0
Duty due to government	8,327	17	7
Amount due for advertising	15	0	0
Bad debts	708	7	4
Overpaid by agents	65	13	4
	£74,796	14	3

Cr.	£	*s.*	*d.*
By Balance at London and Westminster Bank	12,044	19	5
Government security for stamps	1,228	8	2
Cash in office	28	12	1
Consols	8,944	2	0
3¼ per cent. guarantee fund	509	17	10
Furniture, fire engines, &c.	2,057	4	7
Loan fund	1,069	5	2
Stamps on hand	256	0	9
Due by agents on fire account	16,270	10	7
Due by agents on life account	4,245	9	3
Due by agents on hail account	1,082	6	11
Lease of offices	400	0	0
Balance	26,659	17	5
	£74,796	14	3

Scottish Amicable Life Assurance Society.—Annual General Meeting held 4th April 1850.—The Report for the year ending 31st December 1849 stated that the business has exceeded that of the previous year both in the number of policies and the amount of the sums assured. The amount of claims in consequence of the cholera is in greater proportion of the sums assured than the accounts of the Society have yet exhibited, and have fallen more on the larger policies; yet the proportion has only been about two-thirds of the amount that might have been expected according to the tables. The Act of Parliament incorporating the Society has now been obtained. Full tables are in course of preparation for some classes of insurance, to which the rates of the Society were formerly inapplicable in practice.

Scottish Equitable Life Assurance Society.—Nineteenth Annual General Meeting, held 14th May 1850.—The Report gave the following abstract of business relating to policies which had been transacted by the Society during the year ending 1st March last:—

1. Policies issued, 482; sums assured, £251,350; premiums, £9263 17*s.* 4*d.*
2. Policies lapsed by death (including bonuses), £42,568.

The increase on the number of policies made on the preceding year was 45; on the amount assured, £43,425; and on the premiums and entry money, £1905.

The decrease on the amount lapsed by death is £2819.

The total sum remaining assured in the Society at 1st March 1850 amounted to £3,214,121; the annual revenue of the Society at the same date was £120,978; and the accumulated fund amounted to £572,817.

The Committee appointed to make the fourth investigation into the affairs of the Society had reported as follows:—

1. The gross funds, assets and property of the Society amounted at 1st March 1850 to £1,713,681 19*s*. 5*d*., viz.—

	£	*s*.	*d*.
I. Funds realized	602,096	7	5

Which sum is invested as follows:—

	£	*s*.	*d*.
1. Loans on heritable securities and mortgages	324,338	17	6
2. Do. on the Society's policies	48,507	19	5
3. Do. to railways on debentures	106,447	5	2
4. Reversions, and policies, and annuities, purchased	45,433	16	9
5. Government annuities	24,937	18	11
6. Outstanding sums, chiefly premiums (strictly belonging to the funds of the year ending 1st March 1850), but not falling to be remitted till after that date	37,869	15	0
7. Loans on various policies and securities	9,310	14	8
8. House property and furniture, St. Andrew Square, Edinburgh (head office)	5,250	0	0
	£602,096	7	5

	£	*s*.	*d*.
II. Present value of contributions or premiums of assurance receivable by the Society, after deducting two-and-a-half per cent. for expense of collection	1,111,585	12	0
Gross funds	£1,713,681	19	5

Second.—The whole obligations of the Society amounted at 1st March, 1850, to £1,585,097 18*s*., viz.—

	£	*s*.	*d*.
I. Various sums outstanding, including policies which had emerged at 1st March 1850, but had not been paid at that date	29,278	18	0
II. Present value of sums contained in, and to become due by the Society's policies	1,555,819	0	0
Total value of obligations chargeable on the funds	£1,585,097	18	0

	£	*s*.	*d*.
Thir —The gross funds of the Society thus amounting to	1,713,681	19	5
And the total obligations to	1,585,097	18	0
There arises a surplus, as at 1st March 1850, of	£128,584	1	5

The Committee had made the foregoing valuation in conformity with the law which required the calculations to be made according to the Northampton Table, both for the reversions and the annual premiums, and at the assumed rate of 4 per cent. The surplus, therefore, now exhibited in favour of the Society, they consider, according to the enlarged experience of the present day, to be less than the surplus actually existing. Two-thirds of the above surplus amount to £85,722 14*s*. 3*d*.; and it appears from the calculations made by the manager that an allocation of £76,619 2*s*. of this sum will afford a vested addition, at 1st March 1850, at the rate of 2 per cent. per annum, to all policies of five years' standing at that date, equal to a bonus of £152,231 15*s*. 10*d*., payable at the death of the parties entitled thereto, leaving still £9103 12*s*. 3*d*.

between the sum allocated and the two-thirds placed by law at the discretion of the Directors for allocation.

The Committee therefore unanimously recommended that the vested additions be made according to the above scheme; and further, that prospective additions, at the rate of 2 per cent. per annum, should also be made on all policies which may become claims between the 1st March last and the next triennial investigation on 1st March 1853, and which at the time they become so shall be of full five years' standing.

At the court on the 2nd May this Report was approved, and the additions declared accordingly. All vested additions may be surrendered, or commuted into deductions from the premiums, according to rates specified in a table sanctioned by the Society for that purpose. Loans will be granted on policies entitled to vested additions to the amount of four-fifths of the value of such policies according to the Northampton Table, at 4 per cent., with bills by the borrowers, bearing interest at the current rate charged in Scotland on first landed securities.

The additions thus declared, and those declared at previous investigations, amount to no less a sum than £440,665.

Mr. Walker, in commenting on the Report, stated that the claims on death by cholera during the past year had amounted to £9000; that nineteen years ago they had not issued Policy No. I., whilst the number issued at 1st of March last was 6486, of which 4896 were still subsisting.

Scottish Provident Institution.—Twelfth Annual General Meeting, held 20th February 1850.—The Report states, that during the past year the Directors have accepted 567 proposals, the sums thereby assured, amounting to £238,219 2*s*., and the yearly premiums to £7212 15*s*. 11*d*. The excess of sums assured over last year is fully one-third. The present position of the Society has been attained without the expenditure of any commission to third parties, not the accredited agents of the Institution.

At 31st December last the subsisting assurances amounted to £1,444,034 3*s*. The fund arising from accumulated premiums at the same date was £134,406 1*s*. 1*d*., and the yearly income from premiums alone, £40,820 1*s*. 11*d*. During the past year 31 deaths have occurred, the amount of claims being £15,354 11*s*.

Progressive View of the Society's Business during the last Seven Years.

Year ending 31st December.	New policies.	Sums assured thereby.	Annual premium on ditto.
1843	256	£126,530	£3348
1844	310	127,645	3510
1845	348	153,437	4090
1846	416	191,102	5483
1847	472	213,632	6171
1848	430	172,714	5199
1849	567	238,212	7212

Solicitors and General Life Assurance Society.—Fourth Annual General Meeting, held 7th June 1850.—Since the date of the last Report, 202 policies have been issued, assuring £84,898 12*s*. 9*d*., and yielding annual premiums of £2694 12*s*. 7*d*., and 3 annuities have been purchased of the Society of the value of £871 16*s*. 9*d*. The total number of policies issued by the Society to this date is 806, covering assurances to the amount of £389,892 18*s*. 5*d*., the annual premium payable under which amounted to £12,174 17*s*. 11*d*.

Deducting lapsed and other discontinued policies, the number now remaining in force (exclusive of 8 annuities) is 685, assuring the sum of £317,340 4*s.* 5*d.*, and producing an annual revenue of £10,157 2*s.* 10*d.*

During the past year the number of deaths, from all causes, was but 4, and the amount of claims by those deaths was £850 only, whilst the premiums received on policies which lapsed during the year amounted to £1238 0*s.* 8*d.*

Since the commencement of the Society up to the present time the total number of deaths has been 9, and the losses by those deaths £2448; whilst the total amount received by the Society during the same period on lapsed and discontinued policies amounted to £2790 17*s.* 5*d.*

Statement of the Receipts and Expenditure for the Year ending 31*st Dec.* 1849.

Dec 31, 1848.	£	s.	d.	£	s.	d.
To balance in hand	888	17	4			
Amount due from agents	127	8	9			
Amount of policy stamps on hand	0	10	0			
				1,016	16	2
Dec. 31, 1849.						
To amount received on account of paid capital fund, viz.—						
Deposit of 5*s.* per share on 290 shares............	72	10	0			
Call of 20*s.* per share on 305 shares............	305	0	0			
				377	10	0
To amount received for premiums, viz.—						
On the participating class	6284	10	9			
On the non-participating class	2618	1	10			
For immediate annuities	200	0	0			
				9,102	12	7
To amount received for Commission on cross assurances				46	16	2
To amount received for interest, viz.—						
Interest on calls paid in arrear	0	7	3			
Discount on claim paid on admission	5	7	6			
Dividends on Stock	332	10	4			
Interest on loans	591	12	0			
				929	17	1
To amount received on loans repaid..				917	18	11
„ For fees, on the transfer of shares				4	8	0
„ For sale of 1,000 Consols at 92⅞, less brokerage, &c..				928	2	6
„ For policy stamps				4	0	0
				£13,328	1	5

Dec. 31, 1849.				£	s.	d.
By amount paid for—						
Printing and stationery				169	15	6
Office expenses....................				152	9	6
Advertising				222	4	6
Medical fees				91	18	9
Commission				470	13	2
Interest, dividends paid shareholders				631	11	10
Renewal receipt stamps				9	15	0
Charges of Management, viz.—						
Agents, charges, postage stamps, distributing reports, circulars, Almanacs, &c. &c.	145	6	4			
Law charges	28	13	0			
Auditors' fees and travelling expenses	34	4	0			
Directors' fees..........	300	0	0			
Rent..................	215	0	0			
Salaries (inclusive of medical officers, and consulting actuary)	1028	18	0			
				1,752	1	4
				3,500	9	7
By amount paid for—						
Premiums on cross assurances	938	4	0			
Annuitants	179	10	19			
Claims	899	0	0			
				2,016	14	10
By amount loaned on security				5,196	13	4
By balances due from agents				215	11	8
By balance, viz.—						
Cash at bankers	2383	0	8			
Ditto in Secretary's hands .	15	11	4			
				2,398	12	0
				£13,328	1	5

London, 30th April, 1850.
Audited, and found correct.
(*Signed*)
W. S. AYRTON, Leeds,
R. W. HAND, Stafford,
M. GOSSET, Coleman St.
J. J. BLANDY, Reading.
R. NATION, Orchard St.
} *Auditors.*

Statement of Assets of the Society on 31*st Dec.* 1849.

	£	s.	d.
Invested in the purchase of £5000 3¼ per Cents., and £5000 Consols	9,140	11	6
Loans on security	15,776	7	3
Due from agents................	215	11	8
Cash at bankers	2,383	0	8
Ditto in Secretary's hands	15	11	4
	£27,531	2	5

London, 30th April, 1850.
Audited, and found correct.
(*Signed*)
W. S. AYRTON,
R. W. HAND,
MONTAGUE GOSSET,
J. J. BLANDY,
RICHARD NATION,
} *Auditors.*

Statement of Liabilities of the Society on 31*st Dec.* 1850.

	£	s.	d.
Claim on Policy No. 85, unpaid	350	0	0

Sovereign Life Assurance Company.—Fourth Ordinary General Meeting, held 2nd January 1850.—A Report from Mr. Neison, the Consulting Actuary, on the state of the Society, was read. In the year ending 9th October 1848, 218 policies had been issued, assuring the total sum of £112,350, at annual premiums amounting to £3221 9*s*. 2*d*., 187 of which policies were issued during the last nine months of the year. The renewal premiums received on subsisting assurances during the past year have been £3570 10*s*. 3*d*.; the premiums received on new policies have amounted to £3043 14*s*. 6*d*., being an increase on the amount of the preceding 2¾ years' business of 86 per cent. The total premiums received during the year were £6614 14*s*. 9*d*.

From the commencement of business to the 9th October last, 638 policies were issued, assuring £296,539, at annual premiums of £8542 5*s*. 4*d*. Of these, 130 policies, assuring £62,205, have lapsed, the annual premiums on which equal £1811 5*s*. 10*d*.

Having made a valuation of the assets and liabilities on existing policies on 9th October 1849, without anticipating any portion of the surplus or profit charges on the future premiums payable to the Society, a surplus exists in favour of the Society, and shows an improved condition as compared with the valuation at the close of last year of £4757 5*s*. 7*d*. The expenses of outfit and establishment of the Society have been made chargeable over a period of ten years.

From the commencement of the Company, there have been made 1140 proposals for assurance of upwards of £625,000; and out of this number 673 only have been accepted and completed. The total amount assured has been £300,000, and the total premiums received thereon upwards of £15,000. The total amount of claims from death (4 lives having fallen in) has been £2500, covered by £400 consideration for an annuity which has ceased, and £2795 17*s*. 2*d*., the premiums received on policies which have lapsed. The sum of £3235 has been received for annuities granted. The annual income from premiums now in force is £7300.

A resolution was carried to adopt the principle, that policies should be indisputable on any ground whatever.

A dividend of 5 per cent. was declared for the past year on the capital paid up; and it was stated in the Report, that the interest earned by the capital will, as heretofore, be more than sufficient to pay this dividend.

Standard Life Assurance Company.—The Twenty-fourth Annual General Meeting was held 15th February 1850. It appeared from the statements submitted, that during the year ending 15th November 1849, 808 new policies had been issued, being an increase of 200 on the business of 1848, and a much larger number than was ever issued in any previous year. The sums assured amounted to £429,371 17*s*.; at new premiums, amounting to £14,743 4*s*. 8*d*.

The number of proposals made during the same period was 997, of which 808 were accepted and 189 declined.

The excess of sums assured in 1849 over 1848 is only £33,507 4*s*. 8*d*., the average amount of new policies being for £530, instead of £700, which has been the average for many years.

Of the claims, upwards of one-fifth was occasioned by cholera. The whole mortality however is not so great as in the year 1847, when fever was prevalent.

The following table exhibits the progress of the Company during the past six years :—

Year ending 15th November.	Number of policies issued.	Sums assured.		
		£	*s.*	*d.*
1844	562	387,381	0	0
1845	698	446,026	12	10
1846	592	368,679	7	10
1847	621	443,578	4	11
1848	571	395,864	12	5
1849	808	429,371	17	1
Total....	3852	2,470,901	15	1
Annual average	642	411,816	19	2

The Directors allude to the preparations being made for the division of profits at the end of next year, being the fourth period at which the profits fall to be divided.

It was also stated that the business of the Experience Company had been transferred to this office.

Times Life Assurance and Guarantee Company.—First Annual Meeting, held 12th June 1850.—The Company was completely registered 1st June 1849, and the balance sheet exhibited the amount of business transacted in a period of eleven months. Upwards of three hundred carefully-selected persons had been appointed as agents and medical referees.

Gross sum assured by 217 policies, completed up to 29th May last, £83,222; producing an annual income of £1180 11*s.* 7*d.*

	Number.	Amount.	Premiums.		
		£	£	*s.*	*d.*
Proposals completed and paid upon	217	83,222	1180	11	7
Proposals accepted and premiums not yet paid	62	11,150	201	10	8
Proposals not completed and under consideration	45	9,425	188	18	6
Proposals declined	67	29,720	647	4	7
Total..............	391	133,517	2218	5	4

Not a single loss had been sustained by the Company. The average amount of each policy does not exceed £350, which the Directors have pleasure in drawing attention to, from the numerous advantages attending this class of assurances, and from its spreading the policy liabilities of the Company over so large a surface. It was proposed that interest at the rate of 4 per cent. per annum should be paid upon the subscribed capital.

United Deposit Assurance Company.—Annual General Meeting, June 1850. —The Report stated that the Directors had accepted during the past year, 730 proposals, out of a considerably larger number submitted to them. There are now upwards of 1200 policies held by parties assured, upon which they are paying in, from time to time, in the purchase of assurances, according to the plan of the Society, such sums as they can conveniently lay aside. 955 renewed premiums, in addition to first deposits, have been made up to this date. The amount of mortality experienced had not been much above one-third of the expected mortality according to the Carlisle Tables used by them; and the

Company's funds had been invested throughout at a rate of improvement considerably above that assumed in their calculations. A dividend of 5 per cent. (free of income tax) on the Company's stock was declared payable on and after the 12th instant.

United Guarantee and Life Assurance Company.—First Annual Meeting of Shareholders, March 1850.—The Company was completely registered on the 17th April 1849; and the following is a summary of the business transacted to the end of the last month:—

	Amount of policies applied for.	Policies issued.	Premiums received.
	£	£	£ *s.* *d.*
May to 31st Dec. 1849....	121,402	69,388	703 12 4
Jan. and Feb. 1850	50,210	35,659	496 14 9
Total..........	171,612	105,047	1200 7 1

Above 4000 out of the 5000 shares have now been taken up. Interest at the rate of 4 per cent. on the paid-up capital will, under the deed, be payable after 21st March instant.

The general balance-sheet, made up to the 31st December 1849, represented the receipts to amount to £4125 19*s.* 11*d.*, of which £3420 10*s.* was for the deposit and first call upon the shares issued in December 1849, and £703 12*s.* 3*d.* for premiums received on new policies. The expenditure for preliminary expenses was £1773 19*s.* 5*d.*, and for current expenses £1117 17*s.* 2*d.* The cash at the bankers and in hand amounted to £698 13*s.* 4*d.* Calls remaining due from sundry shareholders, £266 10*s.* Cancelled shares, £69; and amount on loan, £200.

Victoria Life Assurance Society.—The Eleventh Annual General Meeting, March 1850.—The Report states that during the year ending 31st December 1849, 175 new policies were effected, covering assurances for £120,000, and new premiums of £4000 per annum.

The total policies in force on the 31st December 1849, numbered 1097, assuring £710,947, and the income of the Company was nearly £28,000.

The result of the year's business enabled the Directors to carry £11,000 to the General or Assurance Fund, now amounting to over £80,000, whilst the total assets of the Company stand at £114,000 and upwards.

The claims by death, surrendered, terminated and dropped policies, amount to £68,000 on 108 policies. The premiums received on them reached nearly £6400.

The mortality has been somewhat high, from the general unhealthiness and the prevalence of cholera, and there have also occurred the deaths of two persons (assured for £3000) by violent means—one by suffocation, the other a case of murder. The losses by death have arisen on 17 polices, 14 lives assured, and the total amount paid was £9659, including bonuses. Two policies fell in by death from cholera.

The Directors have thought it desirable to reduce the extra premiums heretofore charged for both the East and West Indies, China and other places; they have also ceased to make any extra charge, except in some very special cases, for residence in Canada, New Brunswick, Nova Scotia, Malta, Madeira, New Zealand, Cape Colony, and with some limit in N. America and Australia.

United Mutual Life Assurance Society.—First Annual General Meeting, August 1850.—After explaining that the Directors had been impelled to unusual caution by the prevalence of Asiatic cholera in the autumn of 1849, the Report states, that 167 policies, effecting insurances to the extent of £49,350, had been completed in a period of little more than nine months, and that no claim from death had occurred.

The following is a statement of the business transacted in the above period:—

	Number.	Amount.
		£
Proposals completed and paid up on............	167	49,350
Proposals accepted and premiums not yet paid....	28	7,675
Proposals under consideration	11	3,275
Proposals declined	47	17,975
Total....................	253	£78,275

Referring to the economy with which the business had been conducted, the Directors state, that after deducting the amount paid for the necessary alterations and improvements of the office, little more than £1000 had been expended.

The Directors, under the deed of settlement, have taken powers to provide the sum of £50,000 in support of the mutual system; and under these powers they have advanced the sum of £2000, which has more than defrayed the first year's expenses, including the alteration of premises; thus leaving the premiums for assurance at the credit of the Society to be invested, and to accumulate at interest.

University Life Assurance Society.

Funded and other Property of the University Life Assurance Society.

Description of Stock, &c.	Amount of Stock.			Cost of Stock, &c.*			Estimated Income.
	£	s.	d.	£	s.	d.	£.
3¼ per Cent. Annuities (late 3½) ...	111,356	9	0	109,438	19	2	3,513
3 per Cent. Reduced Annuities......	21,228	14	2	19,615	0	0	618
New 5 per Cent. Annuities	2,852	10	0	3,189	13	7	127
East India Stock	1,500	0	0	3,803	7	6	152
Bank Stock	16,696	1	7	34,226	18	0	1,335
Anglo-Greek Bonds	25,520	0	0	27,596	2	5	1,119
	£179,153	14	9	197,870	0	8	6,864
Long Annuities ....per annum	£13,023	6	0	100,005	17	7	*3,419
				£297,875	18	3	10,283
Exchequer Bills	£3,300	0	0	3,449	2	10	75
				£301,325	1	1	10,358
Amount of Mortgages, Loans, Leasehold Rent Charges, &c....	....			317,045	14	4	13,734
				£618,370	15	5	£24,092
Balances in the hands of Messrs. Drummonds and the Secretary	....			7,136	8	10	
Total on 1st May 1850	....			£625,507	4	3	£24,092

* The difference between this amount and the total annuity received is carried to the redemption of the cost.

Dr.

General Cash Account of the University Life Ass-

	No of Policies.	Sum Assured.	Cash received.
			£ s. d.
Received for Assurances on Single Lives	46	£59,649	1,954 14 4
Do. Joint Lives....................	1	1,000	30 2 6
	47	£60,649	
		£ s. d.	
Renewal Premiums on £1,369,778 3s. 1d. Assurances	......	44,972 6 8	
Commuted Premium	......	500 0 0	
Extra Premiums for Sea Risk, Residence out of Europe, &c.	......	39 10 0	
			45,511 16 8
			47,496 13 6
Interest on Loans, Mortgages, Long Annuity Investment, &c.	......	18,860 4 7	
Dividends on Stock, &c.	......	5,875 19 11	
Amount received for Interest on Exchequer Bills	......	142 16 7	
N.B. Income Tax allowed and not included in above Receipts, viz.:			24,879 1 1
On Loans and Mortgages............ £290 19 1			72,375 14 7
On Annuities and Dividends 522 17 11			
£813 17 0			
Proportion of Long Annuities paid off.	£ s. d.		
Consolidated Long Annuities to Jan. 1860............A act.	1,698 10 8		
Do. do. do. ....B act.	888 6 6		
Do. do. do. ....C act.	3,912 19 10		
Annuities for Terms of Years to Oct. 1859............A act.	471 2 1		
Do. do. Jan. 1860............B act.	2,038 5 2		
		9,009 4 3	
Anglo-Greek Bonds.			
Amount of Bonds drawn and paid off................A act.	520 0 0		
Do. do. do. ....B act.	120 0 0		
Amount of Surplus Dividend received towards liquidation of Premium .... A act.	77 11 7		
Do. do. do. ....B act.	77 16 2		
		795 7 9	
New 5 per Cent. Stock.			
Amount of Surplus Dividend received towards liquidation of Price paid above par..............................	......	14 11 2	
			9,819 3 2
Sinking Fund for Redemption of Rent Charges for Terms of Years.			
On account of Lease at Bagnigge Wells	......	51 1 3	
Do. Arbor Square......................	......	70 4 10	
			121 6 1
Amount received for Stock and Exchequer Bills sold.			
£28,500—3 per Cent. Consolidated Annuities..............	......	27,217 10 0	
£24,000—Exchequer Bills	......	25,178 0 0	
			52,395 10 0
Amount of Loans on Mortgage, &c., paid off	......	15,197 10 0	
Do. of Tithe Loans paid off............................	......	1,515 2 1	
			16,712 12 1
Do. received on account of Fines........................	......	8 9 6	
Do. of Discount on a Claim	......	19 16 9	
Do. Profit and Loss	......	3 7 1	
			31 13 4
Do. received for Policy Stamps	......	......	116 10 0
Do. standing to the Credit of a Mortgagor, after paying Interest due 16 Dec. last......................	......	......	14 2 5
Balances, May 1, 1849. Messrs. Drummonds	......	4,296 7 0	
Secretary	......	110 2 7	
Do., Bills, &c.	......	60 10 2	
			4,466 19 9
			£156,053 11 5

	£ s. d.
N.B. Total Amount invested in Funded Property, &c........................	301,325 1 1
Do. Mortgages, Loans, Leasehold Rent Charges, &c...	317,045 14 4
	£618,370 15 5

And the Income thereon is estimated at £24,092.

ance Society for the Year ending May 1, 1850.

Cr.

		No. of Policies.	Cash Paid.					
	Lives.		£	s.	d.	£	s.	d.
By Amount of Claims paid on account of 1848—1849	3	6	4,200	0	0			
Do. do. 1849—1850	11	19	27,900	0	0			
	14	25	32,100	0	0			
Additions to Claims on account of 1848—1849		......	979	10	0			
Do. do. 1849—1850		......	7,486	10	0			
			40,566	0	0			
Amount paid for Cancelling Policies amounting to £10,500		......	290	0	0			
Do. do. £920 Additions on Policies		......	620	18	0			
						41,476	18	0
Establishment Account.								
Paid Rent of Society's House No. 24, One Year to Lady Day 1850		......	340	1	0			
Do. do. No. 25, One Year and a Half-Year to Lady Day 1850, and One Year's Income Tax		......	211	13	4			
Sundry Disbursements for Taxes, Receipt Stamps, Advertisements, &c., to April 1850		......	376	3	2			
Stationery, Printing, Account Books, &c.		......	109	13	4			
Directors		......	1,200	0	0			
Resident Director		......	800	0	0			
Auditors		......	50	0	0			
Physicians		......	18	18	0			
Corresponding Directors		......	160	0	0			
Secretary and Clerks		......	1,094	5	11			
Annuity to Mr. Draper's Widow		......	40	0	0			
Messenger, Coals, Candles, &c.		......	170	0	0			
			4,570	14	9			
Paid Sundry Bills for Repairs, &c.		......	43	6	7			
Paid Solicitor's Bill		......	36	13	6			
						4,650	14	10
Amount invested in Government Securities.								
£12,500 3 per Cent. Reduced Annuities		......	11,615	0	0			
£13,000 3 per Cent. Consolidated Annuities		......	11,961	5	0			
£33,369 0s. 5d. 3½ per Cent. Annuities		......	32,829	17	6			
£23,800 Exchequer Bills		......	24,978	2	0			
						81,384	4	6
Amount lent on Mortgage and other Securities		......	......			18,870	0	0
Amount paid on account of Interest on Capital £30,000		......	......			1,765	5	0
Do. of Annuities granted in lieu of Additions to Policies		......	......			675	0	3
Amount paid for purchase of Policy Stamps		......	......			95	0	0
Balances, May 1, 1850. Messrs. Drummonds		......	7,027	7	5			
Secretary		......	95	2	7			
Do., Bill		......	13	18	10			
						7,136	8	10
						£156,053	11	5

Examined and Approved,
June 8, 1850.

(Signed) James Adey Ogle.
George Pryme.

United Kingdom Temperance and General Provident Institution.—Report for the Ninth Year, ending Nov. 1849.—In the last Annual Report the Directors stated an increase in the year's business, as compared with former years, of 30 per cent. They now report a further increase of 100 per cent.

The balance in favour of the Institution on 20th November 1849 was £31,153 4*s*. 2*d*.

The amount of premiums and interest received during the year was £14,479 19*s*. 7*d*.; and the amount of claims on death, £3325.

The sum of £651 1*s*. 9*d*. has been paid for the purchase of policies and returns of premium.

The number of policies issued during the year ending 31st Dec. is 910.

The annual premiums on these policies amount to £5351 10*s*. 8*d*.

These policies are divided as follows:—

Temperance section, life policies	397	for £70,000
Temperance section, funeral fund	58	635
Public section, including department 11	419	74,637
Total life assurances this year	847	£145,272

The remaining policies are for annuities, deferred sums and endowments for children.

The total number of policies now issued is 4077, bearing annual premiums of £18,787 15*s*. 2*d*.

The net annual revenue from premiums and interest, after deducting lapsed policies and those in arrear, is £15,999 3*s*. 7*d*., being an increase of £4986 5*s*. 9*d*. since last year.

The deaths during the past year have been as follows:—

Temperance section, departments 1 and 2	19
Temperance section, funeral fund, £20 and £10	4
Public section, departments 9 and 11	3
Total deaths among 2795 policies in force	26

Notwithstanding the ravages of cholera, the deaths have been under 1 per 1000; although out of the 1074 lives in department 1, nearly one-half are over 40, 64 are over 60, and only 38 under 25.

Of the 73 deaths which have occurred during the past nine years, 11 have been in the funeral fund for sums of £20 and under, and 6 have been those of persons charged extra premiums as inferior or hazardous lives, 3 have been occasioned by accidents, and 14 by cholera and other epidemic diseases.

Widows' Fund of the Faculty of the Advocates of Scotland.—Report of the Third Investigation into its affairs, June 1850.—This Fund was established in 1829, and was shortly afterwards sanctioned by Act of Parliament, after which year all gentlemen entering the Faculty were bound to contribute to the scheme. In July 1829 it was remitted to Mr. Cleghorn to make the necessary calculations. In his preliminary Report, that gentleman decided to assume that the funds could be improved at 4 per cent. interest; Mr. Finlaison's Report in 1829 having stated that the average rate of interest realized from the 3 per cents. during the previous forty years had been 4½ per cent. He also fixed the allowance for expenses of management, and for losses and contingencies, at 15 per cent. on the annual rates and redemption monies. By the Act of Parliament, it was provided that the first investigation should be made in February 1835, and afterwards septennially from that date. The first was made by Mr. Cleghorn; the second and third by Mr. Ivory. In the first Report, Mr. Cleghorn, in comparing the experience of the Fund with the assumptions, stated that the average of entry was assumed to be 24 years, and that the average age of the contributors since 1832 was on entry 24 years

50 days. The rate of mortality assumed was that according to the Carlisle Table, by which the number living in 1835 would be computed at 93·46; the actual number was 93. It was assumed that the funds would be improved at 4 per cent. interest; the rate actually realized was £3 17*s*. 2*d*.

In the second investigation, made by Mr. Ivory in May 1842, it was stated that the actual average age of entry was 24 years and 140 days; that there were eight marriages fewer than might have been expected; that the rate of interest received was £3 16*s*. 8*d*.; and that after deducting, from the value of the capital and of the future contributions, the value of the existing and expected annuities, and 15 per cent. on the contributions for charges and other contingencies, there remained a surplus of £823 10*s*. 4*d*. The valuation was made on the assumption that 4 per cent. was the realized rate of interest; but Mr. Ivory explained, that from calculations he had made, he considered the sufficiency of the Fund would be amply secured even if 3½ per cent. only could be obtained.

In the third investigation, which has just been completed by Mr. Ivory, the comparison of the actual results, with those expected, is briefly given as follows:—

1. The average age of entry for the whole period of the scheme has been 25 years and 111 days in place of 24 years as assumed.
2. On the assumption of five-sixths of those entering at 24, and reaching 30, marrying at that age, there should have been 40 marriages in the last seven years, while there have been only 24, thus diminishing the number of widows that might be expected to become chargeable to the Fund.
3. It was assumed that five-eighths of the first marriages would be dissolved by the death of the husband. Out of 34 marriages dissolved since the formation of the scheme, there should accordingly have been 21 by the death of the husband and 13 by that of the wife, whereas the actual numbers were respectively 18 and 16.
4. According to the Carlisle Table, there should have been 15 deaths since 1842, whilst there were only 13.
5. The rate of interest realized in the last seven years has been £3 17*s*. 1*d*. instead of £4 per cent.

The statement of Assets and Obligations, calculated at the assumed rate of 4 per cent., is given as follows:—

Assets.	£	*s.*	*d.*
1. Capital realized	42,597	18	2
2. Value of future contributions	17,582	6	9
	£60,180	4	11
Obligations.	£	*s.*	*d.*
1. Value of annuities to *existing* Widows	14,861	19	1
2. Value of annuities to expected Widows, viz.:—			
1. To Widows expected out of subsisting marriages	23,557	4	5
2. To Widows expected to be left by Members at present bachelors	6,857	8	1
3. To Widows of expected *second* marriages	2,042	1	7
	47,318	13	2
3. Entry money paid by 16 applicants for admission	800	0	0
4. Allowances of 15 per cent. on value of annual rates and redemption money for charges, losses and contingencies	3,054	5	0
	51,172	18	2
Leaving a surplus of	9,007	6	9
	£60,180	4	11

Though Mr. Ivory considers that from various sources not calculated on in the original scheme the 4 per cent. assumed rate of interest will probably be realized, yet even on the calculations made at 3½ per cent. interest, a considerable surplus will remain, as appears by the following statement:—

Assets.	£	s.	d.
1. Capital as before	42,597	18	2
2. Value of future contributions	18,704	7	1
Amount	61,302	5	3

Obligations.	£	s.	d.	£	s.	d.
1. Value of annuities to *existing* Widows	15,583	14	4			
2. Value of annuities to *expected* Widows	36,950	3	2			
	52,533	17	6			
3. Entry money as before	800	0	0			
4. Allowance for charges, &c.	3,246	11	11			
				56,580	9	5
Leaving a surplus of				£4,721	15	10

With regard to the application of this surplus, Mr. Ivory considered it would be more advisable to allow it to accumulate till the next investigation in 1856, when no doubt a considerable addition may be made to the annuities of widows.

INSTITUTE OF ACTUARIES.

"*Nous avons vu depuis longtemps, avec des regrets stériles, s'amoindrir de jour en jour la réputation de notre profession: en cela nous subissons le sort inévitable de toutes les professions que le* premier venu *peut prendre et exercer sans aucune espèce de contrôle.*"

"*Un remède à un état de choses si déplorable avait toujours paru impossible, aussi le mal grandissait-il sans cesse.*"

"*Heureusement quelques uns de nous ont pu comprendre que s'ils ne venaient se ranger sous l'égide d'un lien commun toute solution heureuse serait impossible, et ils ont pensé, avec raison, trouver ce lien dans la formation d'un cercle où tous qui veulent faire la profession honorable et distinguée viendraient apporter le tribut de leurs lumières et de leurs efforts.*"

We extract the above paragraphs, with some slight alteration, from Monsieur Dubroca's 'Revue des Assurances.' They are not applied, in that gentleman's able periodical, to the actuarial profession; but they express so happily the condition of that body, and record so appropriately the steps recently taken to remedy that condition, that we have thought we could not do better than preface them as a sort of text to our own observations.

It is now nearly a century and a half since that peculiar science which it appertains to the actuary to cultivate has been called into exercise in this country. The science itself has been well described as having its origin in the application of the doctrine of probabilities to the affairs of life, and as embracing all monetary questions involving a consideration of the separate or combined effects of interest and probability. Whilst, on the one hand, the growth of institutions which derive their principles of operation from this science has been without parallel both in its extent and rapidity, there has been no want, on the other, of well-skilled professors of it, who have been always at hand to meet the ever-increasing demands of more complicated social relations, and to give the required impulse or check to the vast and multiform institutions arising out of them. What the acquirements are which were thus called into play it would not be easy, in a short notice, to give an idea of; they will be best understood by reference to the writings of such men, amongst many others, as the two Bernouillis, Deparcieux, Duvillard, Kerseboom, Lacroix and Laplace on the continent; Francis Baily, Griffith Davies, De Moivre, De Morgan, Gompertz, Dr. Halley, Jones, Lubbock, Milne, Price and Simpson in this country. These are the productions of philosophers, mathematicians and men of letters. We may be permitted to express a doubt whether they come wholly within the grasp of ordinary professional minds; nevertheless the actuary of the present day must be more or less thoroughly conversant with them, at least with so much of them as relates to his peculiar pursuits; and when this is done, he has mastered merely the principles or theory of his profession. The application of the knowledge thus acquired to the results constantly being gleaned from the wide and inexhaustible fields of statistical inquiry is alone the employment of a life-time; and scarcely will the experience of a life-time perfect the judgement which is to be exercised in the selection of data adapted to one purpose, and the detection of causes which render them unsuited for another. But whilst immersed in these considerations, it is the more immediate business of the actuary's life to carry his applied principles into operation; to construct, in the first instance, the complicated machinery by means of which the various processes with which he has to do are to be regulated; and to keep a watchful eye upon its daily action, that the errors of construction or of operation, if there be such, may be detected and expunged. At this stage he enters upon the duties of something like ordinary commercial life. He must be perfectly master of systems of account far exceeding in intricacy its usual requirements. He should be familiar with the routine at least of banking operations, if not with the doctrines of currency and finance in their more comprehensive character. He will be impeded at every step without a very considerable acquaintance with the principles of common law and the practice of the courts; nor can he be wholly ignorant even of the science of medicine, so far at least as regards the nature of the diseases to which the human frame is liable, and the extent to which they affect its duration. Lastly, it behoves him to possess a clear and sound judgement, with an intellect sufficiently penetrating to detect the numerous fallacies which continually present themselves in this peculiar pursuit, and which all writers on the subject have agreed, occasionally assume a degree of subtlety rarely to be met with in any other branch of philosophical inquiry.

. . .

	Presented by
Fever—Observations on the Generation thereof. By Dr. W. P. Alison (2 copies)	Mr. Jenkin Jones.
Halley's Comet. By Lieut. W. S. Stratford, R.N.	do.
Health of Towns' Association—Report on Lord Lincoln's Bill	do.
Insurance—An Essay thereon, 1828 (3 copies)	do.
Islington Literary and Scientific Society—Ninth Annual Report	do.
Juvenile Delinquency in Manchester. By W. B. Neale, 1840	do.
Law Magazine, November 1837	do.
——— ———, May 1840	do.
Law Reform—The Principles thereof, 1835	do.
Leicester—A Plan for the Improvement thereof	do.
London Welsh Provident Society—Rules thereof, 1838	do.
North British Review, November 1849	do.
Police (General), Letter thereon. By W. A. Miles, 1836	do.
Prisons—Third Report of the Inspectors, 1838	do.
Railways—Demoralization and Injuries resulting therefrom	do.
Railways—Reports of the Commissioners thereof, 1848	do.
Sanitary Progress—Fifth Report of the National Philanthropic Association	do.
Sanitary Condition of the Labouring Classes, Reports thereon, 29 in number	do.
Scottish Population—Statistical Report, 1837	do.
Simpson's Algebra, 4th edition, 1775	do.
Teeth—A Test of Age. By E. Saunders	do.
Tides—An Elementary Treatise thereon. By J. W. Lubbock, F.R.S. (3 copies), 1839	do. do.
Tides—Observations thereon. By J. W. Lubbock, F.R.S., 1838	do.
Statistical Society—Journals thereof, 16 numbers	do.

The following Candidates, duly proposed at the last Sessional Meeting, were elected Associates, viz.

Frank L. H. Collins.
Frederick William Driver.
John Caulfield Hannyngton, Capt. 24th Regt. B.N.I., Deputy Commissioner of the Province of Chowtanagpore in the Bengal Presidency.
James Meikle.
Henry Offord.
James Peyton.
Frederick William Rowlatt.

A paper, by Mr. Spens, was then read, entitled "Is there a Materially greater Risk in the Assurance of a Select Life of from 40 to 45 than of a Select Life of from 20 to 25 for one year?"

Fourth Sessional Meeting, 1850–51. Monday, 24th February, 1851.

Peter Hardy, Esq., V.P., in the Chair.

The Minutes of the last Sessional Meeting having been read and confirmed, the Vice-President announced the following contributions to the Library:—

	Presented by
Leslie's Elements of Geometry, 2nd edition	Mr. David Jones.
Tables of Mortality, deduced from the Experience of the Amicable Society. By Thomas Galloway, M.A., F.R.S., F.R.A.S.	do.
British Almanac and Companion for 1849	Mr. Knowles.
British Almanac and Companion for 1846	Mr. W. Lewis.

Mr. John Coles, duly proposed at the last Sessional Meeting, was elected an Associate.

Mr. Jellicoe then read a paper "On the Rates of Premium to be charged for Assurances on the Lives of Military Officers Serving in Bengal."

Fifth Sessional Meeting, 1850–51. Monday, 31st March, 1851.

Charles Jellicoe, Esq., V.P., in the Chair.

The Minutes of the last Meeting having been read and confirmed, the Vice-President announced that the following contributions had been made to the Library, viz.—

	Presented by
British Almanac and Companion for 1848	Mr. Laurence.
General Board of Health, Report thereof	Mr. Colvin.
—— ——, Appendix A.	do.
—— ——, Appendix B.	do.
British Almanac and Companion for 1848	Mr. Pinckard.
A Property and Income Tax—the Best Tax for the Community. By E. Erskine Scott, F.S.A., and Manager and Actuary to the East of Scotland Assurance Company	The Author.
Assurance and Annuity Tables. By Peter Gray, F.R.A.S., A.I.A., Henry Ambrose Smith, F.I.A., and William Orchard, F.I.A.	The Authors.
Bridge (Rev. B.), Elements of Algebra, 1st edition, 1811	Mr. Pateman.
Colson (N.), The Mariner's New Kalendar, 1706	do.
Garnier (I. G.), Élémens d'Algèbre, 1811	do.
Reynard (F.), an Elementary System of Theoretical Geometry, 1813	do.
Stevenson (R.), A Treatise on the Theory of Equations, 2nd edition, 1835	do.
Taylor's (C.) Elements of Algebra; compiled from Garnier's translation of Euler, 1824	do.
Vince (Rev. S.), A Treatise on Fluxions, 5th edition, 1818	do.
—— ——, The Principles of Hydrostatics, 4th edition, 1812	do.
—— ——, Treatise on Plane and Spherical Trigonometry, 3rd edition, 1810	do.
Wood (I.), Elements of Algebra, 3rd edition, 1801	do.
Woodhouse (R.), A Treatise on Plane and Spherical Trigonometry, 3rd edition, 1819	do.

The following Candidates, duly proposed at the last Sessional Meeting, were elected, viz.

George Stewart, as an Official Associate.
Elwin Henry Owen, as an Associate.

Mr. Higham read a paper "On the Value of Selection as Exercised by the

Policy-Holder against the Company in discontinuing Policies on Healthy Lives, and maintaining in force those on Bad or Doubtful Lives."

The Vice-President announced that the Council had passed the following Resolution, which it was intended should form one of the Bye-Laws of the Institute, viz.

> "That persons who shall not have been officially connected with an Assurance Society for a period of five years or upwards shall be inadmissible as Members of the Institute unless they be approved by two-thirds of the Members of the Council assembled at any Ordinary Meeting."

We have received from Mr. Porter, of the Alliance Assurance Company, "Solutions of the Questions proposed to Candidates for the 'Certificate of Competency' at the second day's examination in June last." We regret that it has been found impossible to make room for them. They shall appear in our next Number if practicable.

List of the Members of the Institute of Actuaries of Great Britain and Ireland, 30th April 1851.

FELLOWS AND OFFICIAL ASSOCIATES.

*Those marked thus * are Fellows.*

Name of Member.	*Name of Assurance Company.*
Auld, John Gunn	Colonial.
*Bailey, Arthur Hutcheson.	
*Balfour, Robert	City of Glasgow, Edinburgh.
*Baylis, Edward	Professional.
*Bell, Thomas	Anchor.
*Berridge, Joseph.	
*Borthwick, Archibald	City of Glasgow, Glasgow.
*Borthwick, James	North British, Edinburgh.
*Boult, Swinton	Liverpool and London, Liverpool.
Brettell, Joseph Cartwright	Royal Naval, Military, and East India.
*Brown, Samuel	Mutual.
*Brown, James.	
*Browne, William Meredith	Westminster and General.
*Bunyon, Charles John, M.A.	Norwich Union.
Burr, Thomas Alfred	Kent Mutual.
*Callender, Henry.	
Camroux, Ferdinand F.	Metropolitan Counties and General.
Chalmers, William.	
*Christie, Robert	Scottish Equitable, Edinburgh.
*Clark, George	Argus.
*Cleghorn, Joseph John.	
*Compton, Theodore	U.K. Temperance and General Provident.
Cook, William	Scottish Equitable.
Cope, Charles James.	
*Crocker, James Sydney	New Equitable.
*Cunningham, William	Scottish Union, Edinburgh,
*Daniell, James	Commercial and General.

Name of Member.	*Name of Assurance Company.*
Davenport, Henry Devereux	Sovereign.
*Davies, Griffith, F.R.S.	Guardian.
Dickson, William.	
*Dickie, Henry David	Caledonian, Edinburgh.
*Dickson, Thomas Goldie.	
*Dove, Percy Matthew	Royal.
Emmens, William	Church of England.
*Esson, George Auldjo	National of Scotland, Edinburgh.
*Ewart, Peter	Standard.
*Farnell, Thomas Willows	Legal and Commercial.
*Farrance, George John	City of London.
*Farren, Edwin James	Asylum Domestic and Foreign.
*Finlaison, John, PRESIDENT	National Debt Office.
*Finlaison, Alexander Glen	National Debt Office.
*Finlay, Gilbert Laurie	Edinburgh.
Finlay, William	Northern, Edinburgh.
*Fletcher, Alexander Pearson	Northern.
*Foley, Thaddeus, F.R.A.S.	
*Fraser, John	Life Association of Scotland, Edinburgh.
Fraser, Thomas	Life Association of Scotland.
*Gibson, Edward.	
*Goodchap, William.	
*Gover, William Sutton	British Empire Mutual.
Grant, George	Scottish Provident.
Griffith, Charles Fox.	
*Hampton, John William	Alfred.
*Handcock, Robert	Leeds and Yorkshire.
*Hardy, Peter, F.R.S.	London Assurance Corporation.
*Hardy, James Charles	National Guardian.
*Hearn, George W.	
Henderson, Benjamin	Liverpool and London.
*Higham, John Adams	Royal Exchange.
*Hillman, William Edward	Star.
*Hodge, William Barwick	General Reversionary and Investment.
*Howard, George	Defender.
*Hughes, Edward	United Kent.
*Ivory, Holmes	National of Scotland, Edinburgh.
Jago, Geo. W. S.	
*Jellicoe, Charles	Eagle.
*Jones, David	Universal.
*Jones, Jenkin	National Mercantile.
Kelday, John.	
*King, John	North British.
*Knowles, John	London and Provincial Law.
*Laurence, John	London Assurance Corporation.
*Lawson, Charles Lucius	Great Britain Mutual.
Leeks, Edward Frederick.	
Lendon, Edwin	Kent Fire Office, Maidstone.
*Lewis, Charles Terrell	West of England, Exeter.
*Lewis, William	Family Endowment.
Lewis, Charles.	
*Lindsay, Donald	Scottish Widows'.
Liveing, Charles.	
*Lodge, Jeremiah, B.A.	Palladium.
Lodge, Robert John	Marine.
Macintyre, Patrick	United Kingdom.
*McCandlish, J. Macgregor	National, Edinburgh.
*Moinet, John	Caledonian, Edinburgh.
More, Louis	Mentor.
*Mullinder, Thomas, LL.D	United Guarantee.
Musgrave, Thomas.	

Name of Member.	*Name of Assurance Company.*
*Neison, Francis G. P.	Medical, Invalid and General.
*Neison, William	Medical, Invalid and General.
*Newman, William Lewin	Yorkshire.
*Newman, William Lewin, Jun.	Yorkshire.
*Orchard, William.	
*Oughton, David	General.
*Pearson, Charles.	
*Peck, Anthony, B.A.	Engineers', Masonic, and Universal Mutual.
*Pinckard, George Henry	Clerical, Medical, and General.
*Porter, Henry William.	
Pott, Thomas Alfred	Gresham.
*Rainie, Robert	Life Association of Scotland, Edinburgh.
*Raleigh, Samuel.	
*Ramsay, George	Scottish Union, Edinburgh.
*Ratray, William	Victoria.
*Reddish, John	British.
*Robertson, Alex. Wier.	
Robertson, Alexander	London Indisputable.
*Robinson, Wm. Thomas	Minerva.
Robinson, Thomas.	
Rowsell, Charles John.	
Scott, William	Ægis.
*Scott, Ebenezer Erskine	East of Scotland, Dundee.
*Scratchley, Arthur, M.A., F.R.A.S.	Western.
Shaw, William	Royal Farmers' and General.
Singer, Charles Douglas.	
*Smith, Edward Osborne	Reliance Mutual.
*Smith, James	Northern, Glasgow.
*Smith, Henry William	Albert.
Smith, Frederick Garle	Scottish Union.
*Smith, William	English and Scottish Law Life, Edinburgh.
*Smith, Henry Ambrose	Northern, Aberdeen.
Smylie, Samuel	Standard, Dublin.
*Spens, William	Scottish Amicable, Glasgow.
Spenser, Frederick Charles	Halifax, Bradford, and Keighley.
Stevens, James.	
Stewart, George	North of England, Sheffield.
*Sylvester, James Joseph, M.A., F.R.S.	Equity and Law.
Tait, Patrick Macnaughten.	
*Terry, James Michael	Hand-in-hand.
Thicke, Charles James	British Mutual.
*Thompson, Edward.	
*Thomson, William Thomas, F.R.S.E.	Standard, Edinburgh.
*Thomson, Henry Thomas	North British.
*Thomson, George	Merchants' and Tradesmen's.
*Thomson, George Augustus.	
*Todd, Benjamin Hall	Standard, Edinburgh.
*Todhunter, Joseph	National of Ireland, Dublin.
*Tucker, Robert	Pelican.
*Walker, Thomas, B.A.	English Widows' Fund and General.
*Watson, James	Scottish Provident, Edinburgh.
*Watson, John	Aberdeen.
Watson, John.	
*Welton, Nicholas.	
*Williams, John Hill	English and Scottish Law Life.
*Williams, Henry Jones	Colonial, Edinburgh.
*Willich, Charles M.	University.
Wilkie, James	East of Scotland Life, Edinburgh.
*Wood, William	Scottish Amicable, Glasgow.
*Wood, William	Northern Reversion.
*Yeats, Alexander	Aberdeen Mutual Friendly Society.

ASSOCIATES.

Those marked thus * have passed their Examination.

Name of Member.

Appleby, Henry.
Ashurst, William Henry.
Aston, Benjamin Richard.
Ball, Henry.
Bampton, James.
Beverley, William.
Boyer, Henry.
Cheshire, Edward.
Child, Christian.
Christie, Robert John Holder.
Clarke, Joseph.
Coles, John.
Collins, Frank Laird Howard.
Colvin, Alexander.
Cookson, Edward Bryan.
Cutbush, Edward.
Cutcliffe, George.
*Day, Archibald.
Doncaster, George.
Driver, Frederick William.
Evans, John Llewellyn.
Fisher, Joseph.
Flindt, Rupert.
Grant, George.
Gray, Peter, F.R.A.S.
Grey, William Henry.
Griffith, Thomas Henry.
Guild, James Wyllie. [B.N.I.
Hannyngton, John Caulfield, 24th Regt.
Hooper, John.
Hutton, T. R.
Jones, Edward Turner.
Keys, George Scott.
Koch, John Edward Campbell.

Name of Member.

Laurence, John Philip.
Logan, Alexander McGregor.
Lovelock, Samuel.
Macandrew, James McLean.
Mackenzie, Kenneth.
Maclagan, David.
Meikle, James.
Moncrieff, John Scott.
Nicholson, Isaac.
Noble, Henry.
Norton, Fletcher Carioca.
Offord, Henry.
Oliver, John Lauer.
Owen, Elwin Henry.
Pearson, Arthur.
Peyton, James.
Preston, William Howell.
Rowlatt, Frederick William.
*Scoones, Philip.
Sharpe, Edgar.
Smith, George Frank Stanton.
Stephenson, Charles.
Stubbs, Joseph Neatby.
Swiney, William.
Thomson, Henry, Jun.
Tresidder, John Edward.
Unwin, Francis Henry.
Valentine, Algernon Pelham Smith.
Watkins, Charles.
West, Frederick.
White, William.
Williams, Henry Oliver.
Winser, Thomas Boorman.
Winter, Robert, Jun.

THE

ASSURANCE MAGAZINE.

The Practice and Experience of the CLERICAL, MEDICAL, AND GENERAL LIFE ASSURANCE SOCIETY, *chiefly with reference to Invalid Lives. By* GEORGE H. PINCKARD, *Actuary of the said Society; Fellow of the Institute of Actuaries, and of the Statistical Society.*

[Read before the Institute of Actuaries, 28th April, 1851.]

IN the year 1823 a plan was projected, by the late Dr. George Pinckard, for establishing an Assurance Office which should undertake, as its leading feature, to grant policies on lives deviating so much from the common standard of health as to render them wholly inadmissible at any Office then existing. In pursuance of this plan, the Clerical, Medical, and General Life Assurance Office was established early in 1824. In the absence of any trustworthy data which might serve as a guide, the projector considered that the object in view could be accomplished, with safety, only by the aid of more extended and diversified medical knowledge than was obtainable by Offices dependent on the unassisted judgment of one or two medical examiners. In forming the board of directors, therefore, he expressly provided, that of the 17 gentlemen of whom it was composed, 8 at least should be members of the medical profession.

In the selection of these 8 directors, special care was taken to secure men of eminence, distinguished by their attention to some particular class of diseases. Thus, one medical gentleman was selected who was considered particularly conversant with diseases of the lungs; another was chosen for his skill and experience in the ailments with which females are chiefly affected; and the rest, on similar grounds. By this arrangement, whatever might be the complaint with which any applicant had been afflicted, there was always on the board a medical director, peculiarly qualified previous study and practice to estimate the increased risk caused by the complaint in question.

The Society proceeded under this guidance for nearly 11 years, until the end of the year 1834. I then, for the first time, made the best investigation which the facts at my disposal would permit, into the mortality that had prevailed as regarded both the healthy and the unhealthy lives assured up to that date.

The result is shown in the following table:—

TABLE A.

CLERICAL &c. EXPERIENCE.				NORTHAMPTON TABLE.
AGES.	All Lives combined.	Healthy Lives only.	Unhealthy Lives only.	
	One in	One in	One in	One in
20 to 29	96·	122·	30·	64·
30 „ 39	74·	80·	53·	54·
40 „ 49	49·	60·	31·	42·
50 „ 59	37·	41·	29·	30·
60 „ 69	23·	31·	14·	21·
20 to 69	56·	67·	31·	42·

It thus appears that the mortality on the unhealthy lives for the whole period from 20 to 69 has been more than double that on the healthy. At the same time, the average additional premium paid by the invalid class did not exceed 30 per cent. The above results, although derived from the small number of 650 unhealthy lives, were nevertheless considered to militate so strongly against the acceptance of unhealthy risks, that the directors were induced from this date to exercise much greater caution than heretofore in accepting unhealthy lives, and, as a necessary consequence, many persons who before would have been admitted were now rejected.

Although the board never abandoned the principle of admitting diseased lives, yet extreme caution continued to prevail up to June 1843, when a second investigation was made in the following manner:—

First, every invalid case was registered under the head of particular disease on account of which an additional premium been charged. Thus, all persons afflicted with disease of the l were grouped under one head; those suffering from disease of lungs, under another; and so on, until all were classified un 56 different heads of disease. By the aid of the medical dire these 56 distinct diseases were comprehended under 8 classes; each class consisting of diseases having an affinity for each other. There was also a 9th class, termed miscellaneous, embracing persons who had been charged an increased premium on account of their occupation, or on other grounds unconnected with any specific disease. These 9 classes were then formed into one, which exhibited in a synoptical view 1297 invalid lives, being all who had been assured at an additional premium (exclusive of those charged for foreign climates), from the foundation of the Society up to the year 1843.

This being completed, a comparison was then made as to the per-centage of loss by deaths, on the whole premiums received both from the healthy and the unhealthy policies. My next step was to ascertain the rate of mortality which had occurred during the 18½ years from June 1824 to January 1843, on the diseased cases taken by themselves.

This is shown by the following table:—

TABLE B.

AGES.	Clerical &c. Mortality.	Northampton Table.
	One in	One in
20 to 29	69·	64·
30 „ 39	79·	54·
40 „ 49	53·	42·
50 „ 59	37·	30·
60 „ 69	19·7	21·
20 to 69	52·	42·

By comparing the above table with the one before given (Table A.), it will be seen that the increased care exercised, during the 9 years from 1834 to 1843, produced a very beneficial effect; the deaths on the unhealthy lives between the ages of 20 and 69 having been in the proportion of 1 in 31 in the former table, against 1 in 52 in the latter table.

The result of this second investigation having proved favourable, a system has been in operation, during the 6 years from June 1843 to June 1849, by which invalid lives have been accepted rather more freely than before. But in deciding on the acceptance or rejection of proposals on such lives, the directors have not been guided by medical science alone, but have availed themselves further of the light thrown on such risks by facts and experience acquired in the previous 19 years.

With a view of ascertaining the effect of this last-mentioned system, and also of the extended experience on the invalid branch of the Society's business, I have made a third investigation, similar to that already described as made in 1843. All persons on whose lives an increased premium had been charged, have now been arranged under 79 heads; viz., 65 of different diseases, and 14 heads of miscellaneous. These have been grouped into 9 classes as before, and the whole again comprehended in one synopsis; thus exhibiting the experience of the Society for a period of 25 years, from June 1824 to June 1849.

With respect then to the last 6 years, during which the system alluded to has been in operation, I have only to state that 826 policies on invalid lives have been issued; and that the claims by deaths have amounted in that period to 24·9 per cent., or, in round numbers, to one quarter of the whole premiums received. Whether this loss is greater or less than has been sustained by those Offices which have been transacting this kind of business for the same period of time, I have no means of ascertaining; but, in my judgment, the result is not otherwise than satisfactory.

Having thus disposed of the experience of the last 6 years, I will proceed to show the mortality for the 24½ years, from June 1824 to January 1849, on the diseased lives taken by themselves.

The plan for obtaining this rate of mortality is similar to that adopted by Mr. Arthur Morgan, in his valuable and interesting work published in 1834.

The following table will exhibit the mortality above alluded to, the numbers in each column being arranged in decimal periods:—

TABLE C.

DISEASED LIVES.

AGES.	Totals of the number who attained to each Age.	Living, January 1, 1849.	Discontinued.	Died.	This investigation relates entirely to Diseased Lives, and only one Policy is entered on the same Life.—Those charged extra for Climate, &c. are excluded.
2 to 10	25	4	1	—	
10 „ 20	107	14	7	2	
20 „ 30	749	70	79	17	
30 „ 40	2,550	191	136	33	
40 „ 50	3,464	260	131	63	
50 „ 60	2,489	251	92	67	
60 „ 70	1,421	108	36	77	
70 „ 80	498	49	4	45	
80 „ 88	48	7	1	4	
Total	11,351	954	487	308	

From the preceding, the following table has been formed:—

TABLE D.

Ages.	Clerical, Medical, and General.	Northampton.	Carlisle.
	One in	One in	One in
20 to 29	41·8	64·	131·6
30 „ 39	75·2	54·	95·
40 „ 49	54·	42·	70·3
50 „ 59	36·5	30·	54·3
60 „ 69	18·2	21·	24·8
70 „ 79	11·	11·	12·1
20 to 79	39·5	37·	64·7

By this last table it will be seen, that in taking all the ages from 20 to 79, the mortality has kept rather below the Northampton Table,—a fact of considerable importance, when it is stated that the average premium received, during the last six years, has exceeded that table by full 25 per cent.

To exhibit further the comparative mortality on unhealthy lives, in another form, and for one year later, the following table is given for the 12 months ending January 1st, 1850:—

TABLE E.

Ages.	Living, January 1, 1849.	Half of Discontinued deductd.	Number Living.	Half of New Policies added.	Correct Number, January 1, 1849.	Died in the Year, by Cler. &c. Office Books.	Died by Northn. Table.
10 to 19	18	*Nil.*	18	*Nil.*	18	1	*Nil.*
20 „ 29	70	1	69	2	71	1	1
30 „ 39	191	5	186	15	201	1	4
40 „ 49	260	8	252	23	275	1	6½
50 „ 59	251	6	245	15	260	6	8½
60 „ 69	108	3	105	10	115	10	5½
70 „ 79	49	2	47	1	48	5	4
80 „ 88	7	*Nil.*	7	1	8	*Nil.*	1½
	954				996	25	31

As there is at present but one other Office (viz. the Asylum) which can have accumulated any very considerable amount of important facts regarding the risks on diseased lives, it would seem that there do not as yet exist sufficient data for the formation of tables for the assurance of such lives.

Tables formed from the mortality on all the diseased lives, taken indiscriminately, would evidently be of very little value, as the premium required for bronchitis, or liver complaint, would not suffice for a person suffering under consumption, or disease of the heart.

If practical tables for each separate disease are ever to be formed with confidence, it can only be when experience has become much more extensive. In the mean time, the results obtained are such as to justify a perseverance in the system which has been in operation in this Society during the last six years. Combining, as it does, an experience of a *quarter of a century,* with a vigilant observation of the results of that experience as it grows from year to year, a scientific and practical classification of diseases, and a careful application of medical skill in each individual case, it affords a reasonable prospect of arriving at correct conclusions. And it has proved in its operation beneficial to the public: for many persons, whose lives would otherwise have been rejected as wholly uninsurable at most of the other Offices, have been accepted by the Clerical and Medical, on terms proportionate to the risks incurred; while the profit thus yielded to the Society has been on a very moderate scale, and somewhat *less than that derived from the healthy business.*

The system may perhaps still admit of modifications and improvements; and I am well aware of the insufficiency, in some respects, of the calculations that have been presented: but as it has been so far matured and worked with success, it may, by the continued application of the same thought and labour, be ultimately rendered complete; and thus that which, in the first instance, was little more than conjecture, will gradually become converted into something approaching to certainty.

If there be any Office which, for a period exceeding five years, has been in the habit of accepting invalid lives, and in which a careful comparison between the healthy and unhealthy portions of their business has not yet been made, it appears to me prudent, for the welfare of such Office, that a thorough investigation should take place. Numerous instances have, from time to time, come to my knowledge, where the additional premium required has been very slight; and I cannot help thinking that, on investigation, it will prove generally to have been insufficient to meet the extra risk.

If it is thought that the large number of claims by death which may have been made in the first few years, will be compensated by the increased longevity of the survivors, who may be presumed to have perfectly recovered from the malady existing at the time of assurance, such expectation (if the 25 years' experience of the Clerical, Medical, and General Life Assurance Society may serve as a guide) will assuredly be disappointed.

In conclusion, I beg to state, that to any one who feels particular interest in this subject, I shall be willing to show all the details, with some additional tables and plans now in operation for the more perfect attainment of the object in view.

On the proper Allowance to be made for the Surrender of Policies of Assurance. By CHARLES JELLICOE, Esq., *Actuary to the Eagle Insurance Company.*

[Read before the Institute of Actuaries, 26th May, 1851.]

IN any Company or Society for the assurance of lives—let it be constituted in whatever manner it may—it is evident that certain rates of mortality and interest are always prevailing; and that such rates are more or less constant throughout any given period, as the causes on which they depend are more or less stationary.

Now, the annual amount required by any such Company to meet its engagements, will entirely depend upon the particular rates which happen to obtain in it; and hence it becomes a question of the utmost importance to such bodies, to determine as nearly as possible how they are situated in this respect. To show this more clearly, we will suppose that a given Society consists of 1226 persons, each assured for £1000; and that they entered it at the ages which they would do in accordance with the proportions found to exist amongst the persons assured in the London Offices. From the following table it will be seen, that on the assumption of a rate of mortality prevailing, similar to that called the Northampton, and a rate of interest not exceeding 3 per cent. per annum, the sum annually required to provide for the claims will be £43,109; whereas, on the supposition that 4 per cent. per annum is realized, and that the actual mortality corresponds with that which Mr. Griffith Davies has deduced from the experience of the "Equitable," no more than £31,417 will be needed for the purpose in question.

AGE.	Number of Persons assured at each Age.	Northampton Mortality, at 3 per cent. Interest.	Equitable Mortality, at 4 per cent. Interest.
		£.	£.
Under 14	13	247	136
15 to 19	21	427	260
20 „ 24	81	1,828	1,159
25 „ 29	169	4,217	2,797
30 „ 34	215	5,984	4,107
35 „ 39	209	6,568	4,619
40 „ 44	177	6,353	4,596
45 „ 49	134	5,549	4,176
50 „ 54	95	4,584	3,602
55 „ 59	62	3,517	2,853
60 „ 64	35	2,425	1,988
65 „ 69	13	1,129	937
70 „ 74	2	281	187
	1,226	£43,109	£31,417

We may imagine that the Society just keeps up its numbers by the constant influx of new members; and thus, if we suppose the premiums charged to be those derived from the 3 per cent. Northampton Table, the inquiry involves a question whether it has merely enough to meet its engagements with nothing to spare, or is in a condition to pay every claim as it falls in, and still have a surplus annually of not less than £11,692.

I have selected the conditions above quoted, because they probably form the limits within which the rates experienced by most of the well-established Assurance Societies will be found to range; that is to say, the mortality prevailing in them will, in all probability, not be worse than the Northampton, nor better than the Equitable: nor will it be found, generally, that they can improve their funds at a higher rate on the average than 4 per cent., however much within that limit they may exceed 3.

Within these limits, however, it is likely that an almost infinite variety of grades will be found to obtain amongst the existing Companies, especially as regards the rate of mortality; the causes of difference on this head being themselves numerous, and admitting of combinations which no doubt give rise to numberless variations. Thus, the manner in which the lives are selected, whether with medical aid or without,—the predominance in number of town assurances over country ones—of Irish over English—of male lives over female—of young people over those of more advanced age—of persons in wealthy circumstances over those in more humble life—of assurances effected for family purposes over such as originate in pecuniary or commercial transactions;—each of these will exercise a certain influence in proportion as it exists in any given Society, and will be subject to all sorts of modifications, according to the extent to which it enters into combination with either of the others. Hence we may gather, that almost every Assurance Society has an experience, in a great degree, peculiar to itself; and to speak rigorously as regards any one in particular, "that none but itself can be its parallel:" and thus, although we are compelled at the outset to assume a model, such as we have reason to believe the Society will eventually form itself upon, it will be sufficiently apparent, from what has been said, that no time should be lost in determining the real facts of the case, so soon as circumstances afford the means of doing so.

Amongst the questions to the correct solution of which this determination is essential, there are few more important than that to which this paper more immediately refers; viz., the proper Allowance to be made for the Surrender of Policies of Assurance. A little consideration will show that their intrinsic value depends almost entirely upon the conditions to which I have alluded; for upon them depends the amount of the present and future reserve which must always be made to meet the claim.

To elucidate this matter, we will suppose that, in an Office charging the Northampton premiums, assurances are offered for surrender after ten years' duration,—the ages of the persons on whose lives they were effected being at the commencement 25 and 45 years respectively; and let us suppose, further, that the prevalent rate of mortality in the Society has been found to coincide with that called the Equitable, and the rate of interest realized to be 4 per cent. The several corresponding values will then be as follows:—

Ages at Entry.	Annual Premium charged.	Annual Premium required for the Claim.	Amount reserved to meet Claim.	Difference between Premium charged and that required for the Claim.
25	2·403	1·561	8·798	·842
45	3·894	2·890	16·817	·954

We will now assume, that in lieu of the prevalent rates being those above mentioned, it has been found that the rates actually obtain from which the premiums are formed; viz., the Northampton mortality, and 3 per cent. interest. The several values will accordingly be as follows:—

Ages at Entry.	Annual Premium charged.	Annual Premium required for the Claim.	Amount reserved to meet Claim.	Difference between Premium charged and that required for the Claim.
25	2·403	2·403	9·9741	*Nil.*
45	3·894	3·894	17·3016	*Nil.*

On the first hypothesis, then, the Society is receiving annually ·842 and ·954 more than it requires to meet its engagements; and since those payments are thereafter respectively *worth to it* 14·202 and 11·780, it will by the withdrawal of the assurances be a loser to that extent, supposing the whole amount reserved to meet the claim to be allowed for the surrender.

On the second hypothesis, it will be seen that the Society is receiving no more than sufficient to meet its engagements; and that, therefore, it will lose nothing on that score by the surrender of the policies on the like terms.

These two instances will suffice to show how essential the knowledge of the true conditions affecting any given Society is, for the solution of such questions,—and how liable we are, without it, to the constant commission of serious errors even on this head alone.

Considering, then, this point to be established, I proceed to investigate the other principles by which we should be governed in reference to the question of surrenders. And first, it is to be borne in mind that nothing is said between the contracting parties—when an assurance is effected—as to any return in the event of its being discontinued, so far at least as the contract itself goes. I have heard, it is true, of one instance in which the sums to be allowed, at the expiration of successive intervals, were endorsed upon the policy; but the practice, I believe, no longer exists. No doubt, however, the allowance under certain restrictions of some return in such cases has become all but universal. Were it otherwise, it could scarcely be claimed as a matter of right. The option given, on one side only, to break off the contract at pleasure, would seem to be a sufficient condonation, especially when it is considered that the other is exposed by it to no little disadvantage. Nevertheless, the practice, as I have said, has obtained such general sanction, that it would be useless at the present time to gainsay it; and all we can do is to put it under such proper regulations as the circumstances may seem to require.

Referring, then, to the terms of the contract, (which we will first suppose to be with a strictly Proprietary Company,) the assured agree to pay annually sums which we may consider as comprising a provision for the amount assured, and a contribution to profit and expenses. Now, so long as the contract is maintained, it is evident that the *assurers* must be content, whether that part of the premium which they assumed would be sufficient for the risk turns out to be so or not; in other words, whether their profits prove to be as great as they anticipated or otherwise. But if one of the contracting parties seeks to withdraw from his engagement, it seems highly reasonable that the other should avail himself of the opportunity to see how far his anticipations have been realized, and seek to retrieve his position should they not have been so. If, upon investigation, it should appear that the events have corresponded with the assumptions made at the outset, then the assured would seem to be fairly entitled to the proceeds of that part of his payment intended as a provision for the amount assured,—subject however, in every case, to a certain deduction to be hereafter mentioned. If, on the other hand, the events have not corresponded, then the assurers would, I think, be justified in resorting to such changes as would make the event square with the assumptions. That is to say, if the elements assumed were p'_x, A'_x, and ϕ,* and it should be found that they turned out to be p''_x, A''_x, and ϕ'; then, instead of allowing at the end of n years $(p'_{x+n} - p'_x)\ (1 + A'_{x+n})$ for the surrender, it would be fair to reduce such allowance to $(p''_{x+n} - p''_x)\ (1 + A''_{x+n}) - (p''_x + \phi' - p_x)\ a^n$; p_x being the premium charged, and a^n the amount at the rate of interest realized of £1 per annum in n years. This would be no more than a fulfilling of the intention of the original agreement, and could not be reasonably objected to by the retiring policy-holder.†

In a Mixed Proprietary Assurance Company, as it is called, the same reasoning would apply; except that the part of the premium intended as a provision for the additions to the policies, or so much of it as might not be required for the proprietors' profit and the expenses, could not be taken into account,—inasmuch as any variation in it, caused by the variation in the premium for the risk, would always be met by a corresponding one in the amount of the additions, supposing such additions to be made on the correct principle. This will be rendered clearer by considering, that in a Company so constituted, the premium should never be less than that required for the risk, the proprietors' profits and the expenses; whilst whatever more than this is paid will appear in the shape of an addition to the assurance,—the value of which will of course have to be taken into account in the price allowed for the surrender. Hence, in the expression,

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* The provision for contingencies other than the risk.

† This retrospective process is necessary, also, to place all who retire on an equal footing.

$$(p''_{x+n} - p''_x)\,(1 + \mathrm{A}''_{x+n}) - (p''_x + \phi' - p_x)\,a^n,$$

if $p''_x + \phi'$ be less than p_x, the subtractive part will become $+ [p_x - (p''_x + \phi')]\,a^n$, and should pretty nearly represent the value of the additions. If the two be equal, it will indicate that the premium received has been sufficient for the risk, expenses, and profits, and for no more; and if $p''_x + \phi'$ be the greater of the two, it will show that the premium received has not been sufficient for these, and the deficiency will have to be made good accordingly.

In a strictly Mutual Assurance Company, the premium should be sufficient at least for the risk and expenses; and consequently in this case ϕ' will represent the latter only. With this difference, all which has been said in the case of the Mixed Proprietary Company will equally apply to the Mutual.

Thus far, then, the rights of the contracting parties will be fairly adjusted by these arrangements. But, although we provide in this manner against past inequalities, we have not embraced all the considerations which naturally present themselves under such circumstances. It is to be remembered, that the withdrawal of one member from an association of the kind in question operates with considerable disadvantage as regards those who remain: the numbers, being fewer, are subjected to a greater degree of fluctuation, and have a larger proportion of the expenses to pay. It is to be apprehended, too, that those who do retire are generally lives of the best class; and that the mean duration of the lives of the remnant is in this way somewhat lessened. To measure these effects with any degree of accuracy is scarcely possible. They will evidently vary with the numbers which constitute any given Society, with the class of lives which are comprised in it, and with the nature of the business it transacts. It seems, therefore, that all we can do is to assign a certain limit to the loss thus sustained, and which shall be of such a nature as to operate fairly in every case. Such a limit is naturally suggested by the considerations we have been occupied with. I have endeavoured to show that, as regards the past, the equity of the case is no more than met by making such a deduction from the sum reserved for the claim as will re-establish the conditions originally bargained for; and I see no better way of providing against the evils we are now discussing, than to make a similar deduction as regards the future. In other words, I would propose that the Office should retain in all cases of surrender the value of ϕ' for the whole duration of the life; that is to say, its amount improved at the real rate of interest up to the time of withdrawal, and its present value at the like rate of interest for the remainder of the life.

The general expression for the value of the sum to be allowed would thus be

$$[p''_{x+n} - (p''_x + \phi')]\ (1 + \mathrm{A}''_{x+n}) - (p''_x + \phi' - p_x)\ a^n,$$

where in a Mutual Company ϕ' would denote the provision for expenses merely; and in a Proprietary or Mixed Proprietary one, that for the expenses and proprietors' share of surplus, whatever that might be.

This expression would of course include the value of any additions made to the assurance; but it will no doubt be better to substitute for the value of them thus found, that determined in the usual way.

I shall now proceed to give a few instances of the application of this theory, and, with a view to throw a little more interest into the investigation, will endeavour to show its operation in such Societies as the "Equitable" and the "Law," the one a Mutual, and the other a Mixed Proprietary Assurance Company;* assuming that in both the progression (as I will call it, for the sake of avoiding repetition,) is really such as would obtain from a rate of mortality corresponding with Mr. Davies' table, and a rate of interest of 3½ per cent. per annum.

Beginning, then, with the "Equitable," and supposing that $\phi' = \cdot 100$,† the provision in each £100 assurance for the expenses, the results at the expiration of ten years would be as follows:—

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* I cite these two Companies as being of a class "*sans peur et sans reproche.*"

† This is more than the sum required at the present time. For the amount assured is, I believe, about £8,000,000 which at ·100 per cent. would give £8000 for the expenses per annum.

Age at Entry.	Annual Premium charged. p_x	Annual Premium required for Claim. p''_x	Sum reserved for the Claim. $(p''_{x+n} - p''_x)$ $(1 + A''_{x+n})$	Amount of Surplus Premium, or Value of Bonus. $[p_x - (p''_x + \phi')]a^n$	Deduction for future Expenses. $\phi'(1 + A''_{x+n})$	Sum to be allowed for Surrender, exclusive of the Value of the Bonus. $[p''_{x+n} - (p''_x + \phi')]$ $(1 + A''_{x+n})$	Ditto by Northampton Table. $(p_{x+n} - p_x)$ $(1 + A_{x+n})$
25	2·403	1·647	9·600	7·020	1·798	7·802	9·974
45	3·894	3·001	17·669	8·485	1·290	16·379	17·302
55	5·318	4·371	22·835	9·063	·995	21·840	23·419

The sums in the last column but one are exclusive of the value of the bonus for the sake of comparison. As I have said, the latter ought to correspond nearly with the amount in the fifth column, since the one is really nothing more than the result or consequence of the other.

In such an Office as the "Law," the nature of the contract would justify the retention of such part of the premium as was intended for the proprietors' share of profits, as well as the expenses. Let us assume that these two portions of the premium are correctly represented by the decimal fractions ·250 and ·240.* The results, under similar conditions to those I have selected in the case of the "Equitable," would be as follows:—

Age at Entry.	Annual Premium charged.	Annual Premium required for Claim.	Sum reserved for the Claim.	Amount of Surplus Premium, or Value of Bonus.	Deduction for future Expenses and Profit.	Sum to be allowed for Surrender, exclusive of the Value of the Bonus.	Ditto by Northampton Table.
25	2·403	1·647	9·600	2·854	8·808	·792	9·974
45	3·894	3·001	17·669	4·324	6·319	11·350	17·302
55	5·318	4·371	22·835	4·904	4·878	17·957	23·419

From these few examples, it will readily be seen that the value of a policy to be surrendered would, in accordance with the principles I have been advocating, be generally very different from that usually stated as such at the present day. Nevertheless, I would submit that the principles are sound, and should be as far as is practicable adhered to. They demand no more than that the value in question should depend, amongst other considerations, upon the constitution of the Company with which the contract is made, its progress or condition in the interval between the commencement and termination of such contract, and the degree of abruptness with which this last is brought to a conclusion,—elements which, it can scarcely with justice be denied, should enter into the determination of such a question.

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* The amount assured in this Company is not stated. If we suppose it to be about £7,500,000,—£·240 per cent. would give £18,000 per annum (the expenses including commission); and £·250 per cent. would yield £18,750 per annum, which improved at 3½ per cent. for seven years would amount to somewhat more than £145,656, the proprietors' share of the surplus accrued in 1847. It may at once be gathered from this, that the "progression" was much more rapid than that assumed, since p''_x must have been equal to p_x — 1·490, supposing the above items to be correctly quoted.

On the Contrivances required to render Contingent Reversionary Interests Marketable Securities.

[Continued from No. 3.]

THE third question proposed to Mr. Sang is as follows:—

B, aged 30, requires an advance of £100; and in consideration thereof, offers to pay to the lender an annuity during his life after A's death. Required the annuity to be demanded, and the sum to be assured.

The point here proposed for consideration is not the mere amount of the annuity to be charged, the computation for which is sufficiently simple, but the nature and amount of the assurance.

An annuity, to be paid at stated terms during B's survivorship of A, is now worth £4·981 for each £1 of annuity, computations being made at 6 per cent. Hence, for a present advance of £100, an annuity of £20·076 would need to be secured out of the rents, supposing that no reassurance is required.

It is by no means an easy matter to discover any principle which ought absolutely to determine the nature and amount of the assurance. If we suppose that the principle which is to be followed out is that of converting a contingent into an absolute reversion, we may reason as below.

Let C be the residuary legatee of a large property burdened with an annuity during the life of A, and thereafter during that of B. The present value of the two annuities forms a burden on the property, which burden is gradually removed until it be altogether extinguished. The extinction of that burden may thus be regarded as an absolute reversion, of which the contingencies possessed by A and by B form two parts. The death of one of the annuitants will relieve the estate of a part of the burden, and the death of the survivor will remove the burden entirely; and the amount of this relief is the complementary reversion which must be met by reassurance. Any assurance, therefore, conducted on this principle, must be too complex in its arrangements to be brought into actual use. The sum to be assured at B's death is thus left indeterminate, so far as any strict principle is concerned, and must be fixed arbitrarily by some conventional rule. All therefore that can be stated on this head is, that after the amount of reassurance is determined on, the loss caused by it must be computed as has been already shown in the first part of this paper; and that it appears reasonable to secure by assurance that sum which a present advance would purchase at B's succession to A.

The fourth question is as follows:—

B, aged 30, requires an advance of £100; for which he proposes to grant an obligation to pay an annuity during his survivance of A, but with the option of redeeming that annuity at A's death,—the annuity and redemption-money to be both fixed now. What sum and what annuity should be demanded? Also, what sum should be secured from the commencement to cover such risk throughout? As, with such an option, it is presumed that assurance must be opened on the whole life scale, the actuary will have the goodness to state, whether he considers the borrower, in the event of his redeeming at the fixed sum, entitled to have the policy transferred to him.

It is here proposed to allow B to choose, at his succession to A, whether he shall pay down a certain sum, or shall continue to pay an annuity during his life,—the amount of the redemption-money and the amount of the annuity to be fixed now. We must assume that, in making his selection, B will take that course which shall then appear most advantageous to himself. If his succession occur early, he will prefer to pay down the fixed sum, as he will then be able with advantage to borrow money for that purpose; while, if the succession occur when he is advanced in life, he will then choose rather to pay the annuity.

There is a certain age at which it will be to him a matter of indifference; and therefore the lender of the money may proceed as if there were no option, and as if it were agreed that before this age a single payment is to be made, but that after this age the payment is to be made by annuity.

Here we must not omit one element of the consideration, which is yet too little known to be allowed for; viz., the chance of B being in bad health at the time of exercising the option. This element is one of considerable weight; but there are no data known from which the value of it may be deduced.

The ratio which the annuity bears to the single payment must determine the *neutral* age, as we may call it. So that the problem may be solved in many different ways, according to the ratio which may be adopted, or to the neutral age which may be selected.

The choice of either of those is quite arbitrary, and the problem is thus a pure porism; yet it is possible that the following considerations may guide those actually engaged in such transactions.

In the present instance, the sum which must be secured at B's succession to A, is £247·53 for £100 of present advance; while the annuity to be assigned for the same advance is 20·076. The redemption-money is thus 12·329 years' purchase of the annuity; so that if the above sums, or sums in the same ratio, were now to be fixed, the neutral age, or the age at which the selection would be a matter of indifference, would be 41.*

Whether this consideration be or be not sufficient to determine the selection of the ratio 12·329 (or of the neutral age 41), the adoption of these will not diminish the entire generality of the succeeding steps of the investigation, which steps are equally applicable to any other arbitrary assumption.

The question now becomes this, to compute what assurance at A's death, if it happen before B's within 11 years, together with an annuity during B's survivorship, if A's death happen after 11 years, may have the present value of £100,—the assurance being 12·329 times the annual payment.

The present value of £1, to be paid at B's succession to A, if it happen within 11 years, is £·23765; so that the present value of the above-named sum of £247·53, secured in the same way, must be £55·823.

An annuity during B's survivance of A, provided his succession take place after 11 years, is not simply a deferred survivorship annuity; its present value must be sought by computing the value as at ages 41 and 69 of an annuity during the survivorship of B, and then discounting that for 11 years, allowing also for the probability of the group 30—58 existing at the end of that time. Hence the following computation:—

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* It must here be observed, that the survivorship annuity must be taken as having its first payment six months after the date of succession.

Annuity at Age 41 = 12·88970
Joint Annuity, 41 and 69 = 6·76678

Survivorship of 41 . = 6·12292 . Log. = 0·78696
Log. Joint Endowment, 11 years hence . „ = 9·48729
Log. £20·076 . . . . . . „ = 1·30268

Log. £37·751 . . . . . . „ = 1·57693

Whence the value of the second part of the expectation comes out £37·751, which, added to the preceding £55·823, makes in all £93·574. The option thus reduces the present value from £100 to £93·574, or by rather less than 6½ per cent.; and in order to bring the present value up again to £100, we must augment both the redemption-money and the annuity in the ratio of 100 : 93·574. Hence

Log. 247·53 = . . . 2·39361
Colog. 93·574 = . . . 0·02884
Log. 20·076 = . . . 1·30268

Log. £264·52 = . . . 2·42245
Log. £21·455 = . . . 1·33152

That is, for the present advance of £100, and also for the advantage of having an option, B must engage to pay, at his succession to A, the sum of £264·52, or else an annuity during his life thereafter of £21·455,—the option being exercised immediately after A's death.

The subject of reassurance in such a transaction falls next to be considered. In the absence of any complete guide in this matter, we may presume that an assurance of the fixed redemption-money, payable at the death of B, is sufficient to induce the lender to advance the money. Returning then to the amount which would need to be secured were there no option, viz., £247·53, we must ascertain the loss which would be occasioned by such an assurance. The 3 per cent. premium for such an assurance is £4·9035, which, multiplied by the value of a 6 per cent. annuity, gives £68·748; while the value (at 6 per cent.) of the assurance is £52·606. Hence there is a loss of £6·142 by the assurance, which loss falls to be deducted from the £93·574, leaving £87·432. The joint effect of the option and of the assurance is thus to reduce the value in the ratio of £87·432 to £100. The amount must therefore be increased in the same ratio. Hence

Colog. ·87432 = ... 0·05833

Log. 247·53 = ... 2·39361
Log. 20·076 = ... 1·30268
Log. 4·9035 = ... 0·69051

Log. 283·10 = ... 2·45194
Log. 22·962 = ... 1·36101
Log. 5·6084 = ... 0·74884

Whence it follows that B must engage to pay £283·10 at his succession to A, or else an annuity of £22·962 at stated terms thereafter; while the lender pays an annual premium of £5·6084 for the policy of assurance.

This policy of assurance, even though B should pay the £283·10, most clearly belongs to the lender, and cannot be claimed by B, unless a fair equivalent be paid for its transference. The lender has indeed paid for it all along; and it is manifestly unjust that he should then lose the benefit of it. As however it is doubtful that, in the present state of the law, the lender could recover the sum at B's death, from the Assurance Office, it is proper that the proceedings in regard to the policy be clearly laid down in the original contract.

If, in that contract, it be agreed that the policy of assurance is to be transferred to the borrower, in the event of his redeeming, the whole form of the computation becomes changed, since the considerations which will determine the selections are entirely different. B will then consider whether it be to his advantage to pay the redemption-money, less the value of the policy to which he would then be entitled, or to pay the annuity. In this case the problem becomes doubly porismatic, since the sum to be assured is also arbitrary. The ratio of the redemption-money to the annuity, and the ratio of the same redemption-money to the sum assured, having been both settled arbitrarily, or by such considerations as may present themselves to the parties, the computations may be proceeded with. But these would be so excessively complex as to be almost out of the question; and the writer, not anticipating the occurrence of such a case in practice, has not proceeded with the details.

The following is the fifth question:—

B wishes to have the option of redeeming at any time after the death of A. What arrangement should be made to allow the redemption-money to remain the same as originally fixed, in the event of the annuity being redeemed, after it has been paid for a number of years? It is presumed that such an arrangement could be equitably made by a contract to hand over the whole life policy, the increasing value of which would act as a modification of the terms of redemption from year to year.

The problem here proposed differs from the preceding in this, that it allows the borrower to exercise the selection at any time after the death of A; and thus a new consideration is introduced, so that the problem appears more porismatic than ever. But this is again modified by the new consideration, that the right of selection is never at any time to have a value; the value of the annuity, plus that of the policy, being equal at all times to the fixed redemption-money.

From this last-mentioned restriction it can be shown, by a demonstration somewhat intricate, that there is only one possible solution; and that solution has already been anticipated in Case 6 of the above questions. It is therefore unnecessary to say more on the present head.

The last question proposed is as follows:—

On what terms in any of the foregoing cases should the parties be allowed to cancel the whole transaction, A and B being both alive at the time?

This, theoretically, presents little difficulty, although some apparent inconvenience may arise in practice. We have only to compute the values of the obligations on each side; and the difference of these values will then show what must be repaid in order that the whole transaction may be cancelled.

There is nothing in the mode of conducting the calculations which calls for particular notice: but the result of the computation is, in general, such that the lender would have but a very small return for his advances; and thus the Offices are induced to add considerably to the computed price of surrender.

It ought however to be kept in mind, that the lender has enjoyed the chance of making a considerable gain, and that this must be taken along with the price of surrender as forming the entire return for his money.

It must also be remarked, that if the borrower have stipulated for a right of redemption before the death of A, according to a computed price, he has a very great advantage in judging of the course which he may pursue, according to the state of A's health.

The Office has no direct means of ascertaining this; neither can A be required to answer truly questions put to him,—nor indeed could false answers by him be laid to the charge of the borrower. A stipulation that A must be in his usual health at the time of surrender, will thus only partially counteract the force of selection by B; and therefore the lender ought to be very cautious in granting power of redemption to B, while A may be alive.

In strictness, the computations for such a surrender ought to be based upon tables showing the benefit of selection. There are, however, no such tables in existence;* and the writer is again under the necessity of regretting, that the attention of those engaged in Life Offices has never been turned to this very important and interesting subject.†

Sketch of the recent Progress of the Assurance of Life and Property on the Continent. By SAMUEL BROWN, Esq., *Member of the Council and one of the Honorary Secretaries of the Institute of Actuaries, and Actuary of the Mutual Life Assurance Society.*

[Read before the Institute of Actuaries, 30th June, 1851.]

PART I.—FRANCE.

IN laying before the members of the Institute of Actuaries this hasty sketch of the Progress of the Assurance of Life and Property on the Continent, I beg to offer a few words of explanation on what induced me to attempt it.

Understanding that several actuaries and managers of Foreign Assurance Companies were likely to be in England at this time, without any general acquaintance with, or means of introduction to, those who are engaged in similar pursuits and studies in this country, the council of the Institute were led to propose a general meeting and conference, and to offer to them the hospitality and attentions which all classes and professions are vying with each other in paying to our distinguished foreign visitors.

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* This desideratum has been to a certain extent recently supplied by Mr. Edwin James Farren in his work on Life-Contingency Tables, and by Mr. Higham in two papers read by him before the Institute of Actuaries.—ED. *A. M.*

† We have given the whole of Mr. Sang's observations on this subject, rather for the sake of the suggestive character of the discussions in them, than for their practical utility. In a future number we hope to show methods by which the requirements of transactions such as those here referred to may be met with great simplicity and exactness.—ED. *A. M.*

An Exhibition intended rather for the improvement of industry and art, may thus be rendered instrumental to the diffusion of scientific and practical knowledge of a subject daily increasing in importance.

It is probable, also, that by the emulation which friendly intercourse excites amongst men of liberal minds, a vast extension of the social benefits which the assurance of life and property confers, may follow both in this, and in countries where it has been only recently adopted: the happy result may be to rub down our own prejudices, by contact with others,—to gain from them in some branches of assurance novel ideas,—and in others, perhaps, by communicating the knowledge which has been growing up for centuries, save the commission of some errors which we may have learnt by bitter experience how to avoid, or at a heavy cost how to remedy.

At such a time, and to give such humble assistance as lay in my power to carry out the honourable views of the council, and to strengthen the liberal feelings which it is natural for the members of such an Institute to display, it seemed to me that a short account of the growth of the important interests which our guests represent might be both acceptable and useful.

I have to request your indulgence for the imperfections of this sketch, prepared as it is in the midst of much occupation, relating to a subject which is every year undergoing great changes, and difficult to treat by the necessity of choosing, amongst many facts and observations, those which may most concisely express the history of the progress which has been made.

I am indebted very largely to the excellent "Revue des Assurances," which has been for several years published at Paris, by the talented manager of the French Palladium Company, M. Dubroca, for the greater part of the facts relating to the recent progress of Fire, Life, and Marine Assurance in France. To this Revue must be added, for earlier periods, the extremely valuable work of M. Henri Joliat, the present manager of the important Compagnie Française du Phénix, the operations of which showed a sum assured, on the 31st December last, of £144,770,352. This work is entitled "Journal d'Assurance," and extends over a period of ten years, from 1830 to 1840. We have to express our obligations to the author of this latter work, as well as to other managers of French Companies, for the generous manner in which they have favoured us with information; and I may add, that such liberality of mind augurs well for the amicable relations which we desire to see established between members of the profession in both countries. In a subsequent paper, which I hope to lay before you at your next meeting, I shall have the same tribute of grateful acknowledgment to pay to the managers of Companies in Germany.

Fire Insurance in France.

Insurance against fire, the origin of which in France can only be traced to a much more recent period than Maritime Insurance, has nevertheless made a wonderful progress. The first Company regularly formed in France, "La Mutuelle de Paris pour les Immeubles," dates from 1816. The first Proprietary Company, "La Compagnie d'Assurances Générales," bears date 1819, the plan and constitution of which was introduced from England by a small circle of enlightened men, amongst whom was M. de Gourcuff, the present manager of the Company. Since then the number of Companies has increased continually; and although some have amalgamated with others, and some have wound up their affairs, there still exist, in 1851, 53 Companies for Fire Insurance alone, a list of which will be given in another part of this paper.

Notwithstanding the activity with which the numerous agents have introduced the subject of Fire Insurance into the greater number of the departments of France, there is yet calculated to be a large proportion of property which is still exposed to the risk of fire, uninsured, and which is year after year coming within reach of the benefits it offers. We take the estimates made in the year 1844. The sum assured in that year amounted to £785,200,000, producing in premiums £713,200.

The accounts of the Mutual Companies are not generally published; but taking the operations of the larger, and making allowance for the rest, the sums assured may be computed at about £240,000,000, making a total of more than £1,025,000,000 in both classes of Companies.

By examining the statements of M. le Baron Dupin and M. Boudon, it is possible to arrive at a near approximation to the value of assurable property in France.

It would occupy, however, too much space to show how the total of each item was ascertained; and trusting that on such high authority the members of the Institute will be satisfied with the results, I merely subjoin the total value of each class of property estimated.

	£
28,000 Houses in Paris	112,000,000
6,972,000 Houses in the Departments . .	1,368,000,000
Risk of Tenants	400,000,000
Do. of Claims for Damage from Neighbours .	400,000,000
Furniture, &c. in all France	920,000,000
Of Merchandise and Materials in various stages of Manufacture	5,200,000,000
Proportion of Insurances ceasing every year .	200,000,000
	£8,600,000,000

With regard to the last item, it appears to me that as this value forms a part of the whole assurable property, though set free for reassurance, it will not be an addition to the value that could be assured. The item, however, is given as it is computed.

The grand total of these various items represents the large sum of fr.215,000,000,000 = £8,600,000,000 sterling; so that all the different Companies in France together, and carrying on their operations not in France merely, but in Algeria, Switzerland, Belgium, and Spain, have not yet succeeded in procuring a tenth part of the business which is open to their activity and enterprise.

The progress of the Companies has been steadily increasing; and each has been more successful in procuring business in every year, notwithstanding that new Companies have been formed, and it might be feared would diminish the number of insurances in each. On the contrary, the more the subject has been considered, the more has it commended itself to the attention of the people; whilst the principles of order, security, and conservatism have quietly gained ground amongst the great mass of the people, notwithstanding the trials to which they have been recently exposed.

In 1837 and 1838 the then existing Companies were augmented in number by the formation of five new Companies; yet the business which they succeeded in obtaining, and which in 1839 already amounted to upwards of £53,550,000 of sums insured, had acted so little against the interests of the old, that they had also obtained an increase in the same year of £45,144,872 upon the total which they had insured in 1836.

Let us now see whether the accession of six additional Companies, Le Palladium, L'Aigle, Le Sauveur, La Réparatrice, La Paternelle, and La Confiance, established since 1841, have tended to diminish the business of the ten which were already in existence. The following table will show a comparison of the years 1836, 1839, and 1844:—

TABLE I.—*Showing the total Sums insured against Fire in the Proprietary Companies of France, in* 1836, 1839, *and* 1844.

	1836 £	1839 £	1844 £
Compagnie Générale..	92,306,960	108,929,200	120,000,000
„ Royale....	143,371,120	149,651,040	163,925,354
„ Phénix...	109,989,000	121,410,712	133,867,806
„ Union....	50,397,440	57,374,000	75,772,527
„ Soleil	44,865,520	48,709,960	62,000,000
	£440,930,040	£486,074,912	£555,565,687
„ France ...		24,982,111	56,693,135
„ Urbaine ..		11,037,192	34,874,803
„ Providence		6,808,968	38,254,820
„ Sécurité ..		6,250,334	22,000,000
„ Indemnité		4,471,577	19,519,790
		£53,550,182	£171,342,548
	£440,930,040	£539,625,094	£726,908,235
Add the insurances in Le Palladium, L'Aïgle, La Lyonnaise, and La Réparatrice, (the other two not having published their Accounts in 1844).......			58,572,584
			£785,480,819

It thus appears that the five oldest Companies increased their insurances upwards of 10 per cent. in three years, from 1836 to 1839, notwithstanding the large sum insured by five new Companies in the interim; and again upwards of 14 per cent. in the following five years, although the five new Companies had increased in the same time 220 per cent., and that four new Companies had effected insurances to the amount of 58½ millions sterling. The proportions of the total property insured against fire in the Proprietary Companies in each of these periods was nearly as 100—122—178.

The following table affords as complete a view of the progress of all the Proprietary Companies of France as can be given at present, showing the total assurances existing on 31st December in each year, the total of premiums received, of losses incurred, and, wherever it could be ascertained, the net profits realized, independent of the portion carried to the reserve fund.

I have endeavoured also to form a general abstract of the capital actually employed; but the returns are too defective to allow of its being perfected at present.

TABLE II.—*Showing the Sums insured against Fire, the Totals of Premiums, Losses and Profits, (so far as can be ascertained from Printed Accounts,) in the Proprietary Companies of France, for each of the Years* 1843 *to* 1848 *inclusive.*

		1843				1844				1845			
	Date.	Sums assured, 31 Dec.	Premiums received in the Year.	Losses in the Year.	Profits.	Sums assured 31 Dec.	Premiums received in the Year.	Losses in the Year.	Profits.	Sums assured 31 Dec.	Premiums received in the Year.	Losses in the Year.	Profits.
		£	£	£	£	£	£	£	£	£	£	£	£
Générale	1819	116,810,800	116,811	49,028	29,741	120,000,000	117,989	62,111	20,028	128,485,735	121,969	71,325	12,264
Phénix	„	131,607,601	122,071	55,276	30,660	133,867,806	123,964	77,255	20,855	135,867,214	137,340	76,424	23,940
Royale (Nationale in 1848)	1820	153,946,673	142,688	69,685	41,110	163,925,354	153,530	82,558	32,148	170,375,514	144,452	94,091	27,772
Union	1828	71,377,167	63,671	30,960	15,571	75,772,527	66,040	42,948	6,985	80,666,350	71,477	39,898	14,017
Soleil	1829	59,799,480	58,431	28,000	994	62,000,000	59,870	29,414	1,928	72,000,000	62,686	34,789	7,500
France	1837	52,642,536	48,450	19,974	10,701	56,693,135	51,756	29,694	3,608	59,216,202	53,045	25,568	8,977
Urbaine	1838	31,516,054	24,516	9,380	3,764	34,874,803	27,936	12,877	2,956	37,060,486	29,654	14,465	3,557
(Sécurité)	„	21,428,073	21,115	7,393	500	22,000,000	21,070	9,080	1,485	22,178,100	23,579	16,015	..
(Indemnité)	„	16,731,632	16,049	6,554	2,044	19,519,791	18,425	17,721	(Loss) 6,326	22,507,720	..	14,633	..
Providence	„	33,262,179	29,513	13,108	4,856	38,254,820	33,716	18,511	2,289	41,025,718	32,969	20,182	..
(Lyonnaise)	1839	..	..	..	..	30,660,771	21,604	14,897	(Loss) 4,771	35,020,300	..	15,925	..
Nord	1840	..	..	..	..	..	..	..	..	4,400,000	4,964	8,110	..
Palladium	1841	6,138,444	6,311	2,081	254	6,578,260	7,128	3,363	(Loss) 1,311	8,740,000	..	5,800	..
(Sauveur)	1842	..	..	..	..	..	..	..	..	7,286,245	7,128	3,407	..
Aigle	1843	..	..	..	..	7,714,816	9,230	6,330	424	11,400,000	..	5,662	..
(Réparatrice)	„	..	..	..	..	13,618,737	10,910	3,938	..	13,618,737	..	2,884	..
Paternelle	„	..	..	..	..	..	..	..	..	4,502,902	..	4,995	..
Confiance	1844	..	..	..	..	..	..	..	..	3,609,090	3,414	225	..
(Bienfaisante)	1845	..	..	..	..	..	..	..	..	3,509,549	..	1,565	..
		695,260,639 (11 Comp.)	649,626	291,439	140,195	785,480,820 (14 Comp.)	723,168	410,697	92,706	861,469,862 (19 Comp.)	692,677 (12 Comp.)	455,963 (19 Comp.)	98,027 (7 Comp.)
									(Loss) 12,408				
									80,298 (18 Comp.)				

TABLE II.—*continued.*

	1846				1847			1848		
	Sums assured, 31 Dec.	Premiums received in the Year.	Losses in the Year.	Net Profits.	Sums assured, 31 Dec.	Premiums received in the Year.	Losses in the Year.	Sums assured, 31 Dec.	Premiums received in the Year.	Losses in the Year.
	£	£	£	£	£	£	£	£	£	£
Générale	132,000,000	132,088	82,252	8,232	138,000,000	135,714	76,920	138,850,000	132,740	66,406
Phénix	138,014,546	127,901	102,183	2,314	139,581,957	130,733	82,543	140,175,006	131,062	73,656
Royale (Nationale in 1848)	179,761,865	153,827	98,555	27,608	184,576,942	157,796	80,569	182,955,201	156,151	81,148
Union	85,535,140	75,706	47,970	8,889	87,354,270	77,573	48,635	84,141,736	73,338	40,155
Soleil	76,000,000	66,556	36,802	(Loss) 4,551	84,020,096	76,870	31,596	84,850,012	77,464	31,325
France	63,195,979	57,119	32,252	5,738	68,906,676	62,267	37,846	64,293,010	62,089	29,138
Urbaine	39,860,564	31,880	16,653	1,991	41,656,783	33,755	18,644	75,876,123	62,641	29,104
(Sécurité)	..	..	..	..	31,620,064	29,729	14,795	30,420,094	29,139	14,010
(Indemnité)	..	..	..	..	..	..	..	..	..	..
Providence	46,210,624	36,898	23,528	(Loss) 1,067	50,465,800	39,338	15,604	51,610,288	39,161	17,066
(Lyonnaise)	37,513,699	26,401	16,752	..	..	..	..	..	..	..
Nord	7,200,000	7,871	4,060	793	7,410,421	8,069	7,298	9,641,487	10,485	5,954
Palladium	..	..	..	..	18,111,209	20,546	9,317	22,091,732	24,468	10,850
(Sauveur)	..	..	..	..	..	..	..	..	..	..
Aigle	..	..	..	..	14,525,525	16,338	8,608	14,588,588	16,261	4,843
(Réparatrice)	..	..	..	..	..	..	..	..	..	..
Paternelle	3,272,984	3,090	1,500	..	12,547,698	12,285	6,402	17,723,038	15,818	5,275
Confiance	7,682,638	7,311	3,969	..	10,850,615	9,855	3,426	11,579,634	10,422	4,207
(Bienfaisante)	..	..	..	..	..	..	..	..	..	..
	816,248,039 (12 Comp.)	726,648	466,476	55,565 (Loss) 5,618 49,947 (9 Comp.)	889,628,056 (14 Comp.)	810,868	442,203	928,795,949 (14 Comp.)	841,239	413,137

This table requires a few words of explanation. The names of the Companies inclosed within ( ) imply that they have ceased to form separate Companies,—the business being transferred to some of the other 13 Companies now existing. The Companies of L'Indemnité and La Bienfaisante have been amalgamated with L'Urbaine; La Sécurité with La France; and La Lyonnaise with Le Palladium. Where a blank is found against the name of a Company, the particulars required are not quoted in the accounts as given in the "Revue des Assurances;" and I have therefore given at the bottom of each column the number of Companies to which the totals refer. The particulars of the year 1845 have been filled up from the reports of the year, as far as they were then given; but corrected by a statement which subsequently appeared in 1848, in which some of the figures were different, and are presumed to be more authentic. It would not be just to compare the totals of any one year with another, without carefully examining the columns, to see in which of them some of the items may be wanting; and I have therefore, in a subsequent page, formed a comparison only of the older Companies, as to the average of premiums and losses.

Since forming this table, we have been favoured with the subjoined account from M. Maas, the manager of L'Union French Fire Insurance Company, with a general summary of the business of 9 leading Fire Insurance Companies for 1849. The total insured by these 9 Companies in that year amounted to nearly £921,300,000, the premiums on which were £797,788 = ·087 (1*s.* 9*d.*) per cent. on the sum assured; the interest and other sources of income to £31,698; the losses to £383,860, equal to 48·1 per cent. on the premiums received, or ·042 per cent. on the sum insured: the total expenses were £281,756, being 35·3 per cent. on the premiums; the total dividends to shareholders were £113,200; and the sum of the reserved funds, accumulated out of profits from the commencement of each Company, £360,360, being rather more than 45 per cent. of the year's income from premiums.

Taking the number and amounts of losses given in some of the years of Table II., the average of each loss in the Royale or Nationale was found to be about £44; in the Générale and Urbaine £39. 1.; and in La France £38. 2.

TABLE III.—*Showing the Operations of the principal French Proprietary Fire Insurance Companies in* 1849.

Name.	Sums assured, deducting Reassurances.	Total Premiums.	Interest, &c.	Losses.	Expenses.	Dividends to Shareholders.	Profits carried to Reserved Fund since the commencement.
	£	£	£	£	£	£	£
Générale..	162,360,000	131,823	5,179	67,495	44,051	22,080	105,120
Phénix...	141,917,611	132,384	6,547	70,104	42,224	19,120	67,000
Nationale.	178,673,610	146,207	9,341	68,643	45,108	40,000	120,000
Union....	82,181,774	73,180	3,807	33,773	24,721	14,400	40,400
Soleil	75,000,000	68,204	..	30,435	20,398	2,400	
France ...	96,226,850	85,754	3,631	39,175	35,022	8,800	17,400
Urbaine ..	85,059,789	71,363	1,201	28,987	31,486	4,000	8,000
Providence	52,256,908	39,623	1,763	18,478	17,695	2,400	2,440
Palladium	47,616,104	49,250	228	26,770	21,050		
	921,292,646	797,788	31,697	383,860	281,755	113,200	360,360

It will be seen from the last two tables that the premiums are remarkably moderate, scarcely exceeding on an average 1*s.* 10*d.* per cent., including the more hazardous risks, such as varnish and chemical manufactories, &c., as well as those of an ordinary kind.

The amount of losses is not much above the proportion which it is considered they bear to the premiums in this country; and it becomes an interesting question, whether the Companies have by this low rate of premium obtained an adequate interest for the use of their capital, and the risks they run.

It would evidently be unfair to settle this question merely by reference to the experience of newly-established Companies. Many years must elapse before they will be able, by the extension of their business, to diminish the proportion of expenses to the receipts. The probability is, that the costs of management and other charges, independent of commission, must remain very much the same, whether the amount of premiums be large or small. In recently-formed Companies they might even exceed those of the old, through the necessary excess of expenditure in forming new agencies, and bringing them into active operation. If the rate of premium is not higher than in the old Companies, then all that the public are concerned in is to ascertain that the shareholders' capital is sufficient to protect them, till the large amount of business suffices to pay all the expenses out of the premiums, to realize a reserve fund for the assured, and yet afford a fair remuneration to the shareholders for the use of their capital. Low as the rate of charge for Fire Assurance is in France, it appears to be adequate for these purposes, if we make the comparison only between the long established Companies. For this purpose we will take only the seven Companies first mentioned in Table II.

Year.	Sums assured.	Premiums per cent. on Sum assured.	Losses per cent. on Sum assured.	Losses per cent. on Premium.	Profits per cent. on Premium.	Profits.
	£					£
1843	617,700,311	·093	·043	45·5	23·	132,541
1844	647,133,625	·093	·052	56·	14·7	88·508
1845	683,671,501	·091	·052	57·5	15·8	98,027
1846	714,368,094	·090	·058	64·6	7·78	50,221
1847	744,096,724	·091	·051	55·8		
1848	771,141,088	·090	·045	50·45		

It thus appears that, though the insurances have been steadily increasing, and the ratio of the premiums remained nearly the same, (from which it may be inferred that the same class of risks have been taken), yet the losses have varied from ·043 to ·058 per cent. on the sum assured, and the profits in four years fluctuated from £50,221 to £132,541. No wonder that young Companies, dividing the business, are unable to bear such fluctuations as these, without a large capital to meet them and the heavy expenses.

What is the result of including all the Companies in the comparison?

In 1845, M. Dubroca states that the Fire Insurance Companies had then recently experienced considerable losses, and had honourably discharged every claim; but because they resisted payment in one particular case, and declined to continue the assurances in another, a clamour had been raised against them, of which it is but fair to expose the injustice, as well as the ignorance of the principles of assurance, which the enemies of the Companies displayed.

France was without insurance against fire, at least as respects furniture, merchandise, manufactories, &c., until, on the model of the English Companies, first was formed the Compagnie Générale d'Assurance; then Le Phénix and La Royale; and a few years afterwards, L'Union. The vast social advantages which have sprung from the establishment of these older institutions, owe their origin to what appeared at the time the daring speculation of a few strong-minded individuals, who risked considerable capital, at a time when there was little disposition to assist in the enterprise, and small prospects of success.

The Companies existing in 1845—19 in number—offered to the assured a guaranteed capital of nearly £4,000,000. Of this number, not more than 6 were paying dividends; and there were only 9 paying interest on the tenth part of the capital, which is every day responsible for losses.

Some Companies might even be named, which are honourably managed, and skilfully conducted, and yet arrive at their tenth year of existence without paying a centime of interest. How then, it is contended, can there be any reason in the clamour raised against their riches, since, if some few of the older are receiving a fair rate of interest, the rest obtain none at all?

Examining the results of the operations of 1845,* it appears there were

Risks to the amount of more than .	£760,000,000
Premiums received . . .	£680,000

The losses are from 55 to 60 per cent. of the premiums, and in that year they were upwards of £408,000, almost exactly 60 per cent.; leaving only £272,000 between the receipts and the payments for losses. This may appear to some a large amount; but they forget that the business must be carried on by agencies, at a very considerable cost,—a cost which increases every year with the increase in the number of Companies, whilst the net receipts by the Companies are proportionably diminished to their great injury and loss. The assurers even sometimes share with the agents in a portion of the commission, still further reducing the premium which they actually pay for the risks. We must therefore deduct the sum of these returns of the commissions to agents, costs of management, salaries, &c. The average of these expenses is reckoned to be 30 per cent. on the gross premiums received; an average liable to increase, but not very likely to be diminished below this per-centage. Deducting therefore £204,000, there would remain in this case only £68,000 profit, which is still further liable to diminution for the portion destined for reserve funds, the interest on current cash, the difference of interest between the funds at 3 per cent. and the 5 per cent., to which the shareholders may justly consider themselves entitled. Taking all these together, we shall find, says M. Dubroca, an *annual deficit,* and a sufficient explanation why, for the past ten years, the shareholders in the greater part of the Company have neither received dividends nor interest, and yet are held liable every day for considerable risks.

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* The totals will be found to differ a little from those in Table II., the latter having been filled up from returns more recently collected.

After these remarks from a most competent authority, we cannot but come to the conclusion that there must be some serious alteration required, either in the system of charges or expenses of the younger Fire Insurance Companies, or in the establishment of new Companies to compete with the old. The vast augmentation of business displays in a most favourable light the energy and activity of our neighbours, and the remarkable spirit with which they have supported institutions having the most important influence on public and private interest. But that year after year expenses should increase with the growth of the business, and that to such an extent that the shareholders, in the greater part of the Companies, receive no dividends nor interest, implies that there is either a devotedness to the public good, a patient endurance of losses, or an intensity of hope, of which there are few parallels in a commercial country. It would seem natural, either that the premiums should be raised, or the expenses cut down, or the Companies amalgamated with others, by which the latter at least of these desirable objects could be achieved. This last process, indeed, appears to have been wisely, though only lately, adopted to a considerable extent. May not these remarks apply with equal force to many Companies in this country?

We shall watch the further progress of Fire Insurance in France with increasing interest; and finish this part of the subject by the following statistical summary of French Companies for Fire Insurance, and their operations in different parts of France, as published by M. Alfred de Planhol, in the "Gazette des Affaires," and quoted in a recent number of the "Revue des Assurances."

The following is a complete list of the Mutual Companies now existing, with the original date of their formation.

List of existing Mutual Companies for Fire Insurance in France.

SOCIÉTÉS IMMOBILIÈRES.		
Original Date.	Name.	Locality.
1816	Société de Paris	Paris
1819	„ de Melun	Melun
„	„ de Paris	Paris
„	„ de Lyon	Lyon
„	„ de Chartres	Chartres
1820	„ de Strasbourg	Strasbourg
„	„ de Caen	Caen
„	„ d'Orléans	Orléans
„	„ de Metz (La Messine)	Metz
„	„ de Bourges	Bourges
1821	„ de Chalons sur Marne	Chalons sur Marne
1824	„ de Versailles	Versailles
1825	„ de Moulins	Moulins
1826	„ de Marseille	Marseille
„	„ de Tours	Tours
1828	„ de Lille	Lille
„	„ du Mans	Le Mans
1829	„ de Chateauroux	Chateauroux
1843	„ La Neustrie	Caen

SOCIÉTÉS IMMOBILIÈRES ET MOBILIÈRES.		
Original Date.	Name.	Locality.
1818	Mutuel du Rouen (ancien)	Rouen
1819	La Nantaise	Nantes
1826	Société de Valence	Valence
1834	„ de Clermond Ferraud	Clerm. Ferr.
1837	„ La Rouennaise	Rouen
1838	„ de Blois	Blois
„	„ Le Progrès	Poitiers
1840	„ La Clémentine	Rouen
„	„ La Normandie	„
1841	„ L'Economie	Limoges
„	„ La Prudence	Paris
1842	„ La Sauvegarde	Bordeaux
„	„ La Bretagne	Nantes
1825	„ La Nivernoise	Nevers
1849	„ La Garantie	Paris
„	„ L'Union tutélaire	„
„	„ L'Aquitaine	Agen
„	„ La Banlieue	Paris

SOCIÉTÉS MOBILIÈRES.

Original Date.	Name.	Locality.
1837	Société La Parisienne	Paris
1838	„ La Fraternelle...............	„
„	„ Mobilière de Caen	Caen
1842	„ Mutuelle Mobilière du Mans..	Le Mans

There are 19 Companies insuring only immoveable property.
4 Companies for insuring only moveable property, furniture, merchandise, &c.
18 Companies insuring both the above classes of risks.
—
Total.... 41 *Mutual Companies*, the operations of which extend from 1 to 28 departments, with the exception of one doing business in the whole of France but on special risks.
13 *Proprietary Companies* undertaking risks in all parts of France and in foreign countries also.

Out of the 86 departments of France,

1	is worked (exploité) by	9	Mutual Companies.
3	„	8	„
2	„	7	„
2	„	6	„
3	„	4	„
7	„	3	„
12	„	2	„
28	„	1	„
40			
28	are not at present occupied by any Mutual Fire Insurance Company for simple risks (La Clémentine being excepted).		
86			

Of these 40 Mutual Companies, 8 have their chief office in Paris, 4 at Rouen, 2 in each of the towns Le Mans, Caen and Nantes, and 1 in each of 22 other towns enumerated. The list of the 13 existing Proprietary Fire Insurance Companies will be found in Table II., those which have combined with others being distinguished thus ( ).

The total amount computed to be insured at the present time against fire by these, and the Proprietary Companies together, is upwards of £1,300,000,000 sterling.

Whilst this paper was printing, I have been most kindly favoured by M. Maas with the following abstract, which I am very glad to have the opportunity of appending :—

Summary of the Operations of the French Proprietary Fire Insurance Companies for the year 1850.

Companies.	Sums assured.	Total Premiums.	Interest, &c.	Losses.	Expenses and Commissions.	Various Charges.	Dividends to Shareholders.	Profits reserved.	Total Profits reserved from commencement.
	£	£	£	£	£	£	£	£	£
Nationale	180,894,977	143,025	8,930	71,521	45,721	979	36,000	..	120,000
Générale	164,742,890	137,748	6,042	63,142	48,424	149	24,000	8,000	113,120
Phénix	144,770,352	132,110	8,138	66,906	44,527	170	19,200	8,800	75,800
Union..............	84,100,837	75,807	4,579	37,884	25,220	1,189	14,000	2,000	42,400
Soleil	80,000,000	72,089	324	39,193	19,055	..	4,000	..	..
France	96,035,437	85,195	2,287	52,896	29,273	2,924	1,920	644	18,044
Urbaine............	86,302,430	72,105	1,239	35,144	28,686	2,740	4,000	4,000	12,000
Providence	56,587,120	41,699	1,553	25,944	19,366	..	..	..	..
Other Companies	75,439,790	67,719	2,240	22,640	30,522	8,272	3,200	2,440	..
	968,873,833	827,497	35,323	415,270	290,794	16,423	106,320	25,884	381,364
		·085 per cent. on Sum assured.		50·18 per cent. of Premium.	37·125 per cent. of Premium.		12·85 per cent. of Premium.		

(To be continued in our next Number.)

Statistics of Suicide. *By* R. Thompson Jopling, Esq., F.S.S.

In the present paper it is intended to investigate the nature of mortality from Suicide, with a view to assist statists in estimating the value of life, and society in its endeavours to remedy so frightful an evil.

It is usual with Assurance Offices to make void policies which have lapsed from the above cause; and it was not until a very recent period that the justice of this proceeding was called into question,—especially when it is borne in mind that these risks are invariably calculated in the premiums.

The suicides I purpose to analyze, are those which have occurred in London during the five years 1846–50. In the present paper are given those for the years 1846–48, inclusive; reserving the remaining duennial period, with conclusions and remarks, for the next number of the *Assurance Magazine.*

In the weekly reports of the Registrar-General for the three years 1846–48, an abstract is given of each case of death by violence. From these are selected those occurring from suicidal causes, with the particulars of each case; viz., age, sex, profession, occupation, and the means by which the suicide was committed. Some deficiencies I have been enabled to supply, through the kindness of the Registrar-General, from documents in the General Register Office.

The total number of ascertained suicides which took place during the years 1846–48, inclusive, in London, was 769; and the following table shows the distribution of these over different ages:—

Table I.—*Ascertained Suicides, London,* 1846–48.

Age.	1846		1847		1848		Total.		
	M.	F.	M.	F.	M.	F.	M.	F.	Both.
9	2	..	..	..	..	..	2	..	2
10	..	..	..	..	..	..	..	..	..
11	..	..	..	..	..	..	..	..	..
12	..	1	..	..	..	..	..	1	1
13	1	..	..	..	..	..	1	..	1
14	1	1	..	..	..	1	1	2	3
15	1	..	..	..	..	1	1	1	2
16	1	2	1	2	3	1	5	5	10
17	2	4	3	1	1	2	6	7	13
18	3	3	2	5	4	1	9	9	18
19	..	7	4	4	..	3	4	14	18
20	1	..	1	2	3	2	5	4	9
21	1	4	2	1	3	4	6	9	15
22	4	1	3	3	2	1	9	5	14
23	4	1	1	6	3	2	8	9	17
24	4	2	6	3	3	4	13	9	22
25	1	1	4	3	5	..	10	4	14
26	6	3	4	3	1	2	11	8	19
27	2	..	4	2	2	3	8	5	13
28	2	4	3	3	2	2	7	9	16

AGE.	1846		1847		1848		TOTAL.			AGE.	1846		1847		1848		TOTAL.		
	M.	F.	M.	F.	M.	F.	M.	F.	Both.		M.	F.	M.	F.	M.	F.	M.	F.	Both.
29	1	1	..	1	4	2	5	4	9	58	4	1	1	4	2	1	7	6	13
30	3	2	4	3	4	..	11	5	16	59	2	1	1	1	2	1	5	3	8
31	1	1	1	1	4	1	6	3	9	60	4	..	3	1	6	2	13	3	16
32	1	4	4	..	4	3	9	7	16	61	1	3	..	..	2	..	3	3	6
33	4	1	2	2	7	1	13	4	17	62	4	1	1	..	..	..	5	1	6
34	4	2	1	2	5	2	10	6	16	63	3	..	3	2	..	2	6	4	10
35	4	4	1	2	7	1	12	7	19	64	1	2	4	..	1	2	6	4	10
36	..	1	3	2	5	..	8	3	11	65	..	1	2	..	1	..	3	1	4
37	7	1	6	1	7	1	20	3	23	66	1	..	..	..	1	..	2	..	2
38	5	3	5	..	2	1	12	4	16	67	1	2	2	1	2	..	5	3	8
39	6	1	3	..	4	1	13	2	15	68	2	..	2	..	1	..	5	..	5
40	4	3	4	..	8	2	16	5	21	69	1	..	2	1	..	..	3	1	4
41	4	2	5	1	3	1	12	4	16	70	..	..	3	1	..	..	3	1	4
42	5	7	3	2	3	1	11	10	21	71	..	1	..	..	..	..	..	1	1
43	6	1	..	2	2	..	8	3	11	72	..	..	1	1	5	..	6	1	7
44	6	2	3	1	4	1	13	4	17	73	..	..	..	..	..	..	..	..	..
45	3	..	8	..	8	1	19	1	20	74	2	..	2	..	1	1	5	1	6
46	5	2	7	1	1	1	13	4	17	75	..	..	..	..	..	..	..	..	..
47	2	1	6	3	3	2	11	6	17	76	2	..	1	..	..	..	3	..	3
48	2	..	5	1	2	2	9	3	12	77	..	..	..	..	..	1	..	1	1
49	5	1	3	4	5	1	13	6	19	78	..	..	1	1	1	..	2	1	3
50	3	2	2	..	4	1	9	3	12	79	..	..	2	..	..	..	2	..	2
51	..	2	6	1	2	1	8	4	12	80	..	..	..	..	..	1	..	1	1
52	2	..	4	3	5	2	11	5	16	81	..	..	..	..	..	1	..	1	1
53	4	..	1	..	5	..	10	..	10	82	2	..	..	..	..	..	2	..	2
54	3	1	5	..	2	..	10	1	11	83	1	..	..	..	..	..	1	..	1
55	3	2	5	..	2	2	10	4	14	84	1	..	1	..	1	..	3	..	3
56	5	2	1	..	1	..	7	2	9	Not Stated	1	1	3	..	..	..	4	1	5
57	2	1	1	..	4	..	7	1	8										

The above table will be better understood by the following abstract:—

ABSTRACT A.—*Ascertained Suicides, London,* 1846–48.

AGES.	1846		1847		1848		TOTAL.		
	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	Both
9	2	..	..	..	..	..	2	..	2
10 to 14	2	2	..	..	..	1	2	3	5
15 „ 19	7	16	10	12	8	8	25	36	61
20 „ 24	14	8	13	15	14	13	41	36	77
25 „ 29	12	9	15	12	14	9	41	30	71
30 „ 34	13	10	12	8	24	7	49	25	74
35 „ 39	22	10	18	5	25	4	65	19	84
40 „ 44	25	15	15	6	20	5	60	26	86
45 „ 49	17	4	29	9	19	7	65	20	85
50 „ 54	12	5	18	4	18	4	48	13	61
55 „ 59	16	7	9	5	11	4	36	16	52
60 „ 64	13	6	11	3	9	6	33	15	48
65 „ 69	5	3	8	2	5	..	18	5	23
70 „ 74	2	1	6	2	6	1	14	4	18
75 „ 79	2	..	4	1	1	1	7	2	9
80 „ 84	4	..	1	..	1	2	6	2	8
Not stated	1	1	3	..	..	..	4	1	5
Total	169	97	172	84	175	72	516	253	769

It will be seen from the preceding abstract, that deaths by suicide were greater during the years 1846 and 1847—the period of the railway panic—than in 1848; but the most remarkable fact shown by this table is, that the increase is entirely among the females, the deaths being 97, 84, and 72, respectively.

In connection with this subject, it is interesting to know the manner in which suicides at various ages, and among the different sexes, have been committed. With a view to illustration, the following table has been constructed; and although the numbers with which we are at present acquainted, bearing on different ages, are not sufficiently numerous for comparison, yet I have considered it best to give the table in full, as a groundwork for future investigators.

TABLE II.—*Ascertained Suicides, London,* 1846–48.

Committed by	Age.	1846		1847		1848		Age.	1846		1847		1848	
		M.	F.	M.	F.	M.	F.		M.	F.	M.	F.	M.	F.
Drowning	9	..	..	..	..	..	..	13	..	..	..	..	..	..
Hanging	”	2	..	..	..	..	..	”	1	..	..	..	..	..
Cutting throat	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Stabbing	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Throwing from heights	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Shooting	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Poisoning	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Drowning	10	..	..	..	..	..	..	14	..	..	..	..	..	1
Hanging	”	..	..	..	..	..	..	”	1	1	..	..	..	..
Cutting throat	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Stabbing	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Throwing from heights	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Shooting	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Poisoning	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Drowning	11	..	..	..	..	..	..	15	1	..	..	..	..	1
Hanging	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Cutting throat	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Stabbing	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Throwing from heights	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Shooting	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Poisoning	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Drowning	12	..	1	..	..	..	..	16	..	1	..	..	..	..
Hanging	”	..	..	..	..	..	..	”	1	..	1	2	3	1
Cutting throat	”	..	..	..	..	..	..	”	..	1	..	..	..	..
Stabbing	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Throwing from heights	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Shooting	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Poisoning	”	..	..	..	..	..	..	”	..	..	..	..	..	..

Committed by	Age.	1846		1847		1848		Age.	1846		1847		1848	
		M.	F.	M.	F.	M.	F.		M.	F.	M.	F.	M.	F.
Drowning	17	..	..	..	1	..	1	24	3	1	..	2	..	1
Hanging	”	1	2	1	..	..	..	”	1	1	2	1	1	..
Cutting throat......	”	..	..	..	..	..	..	”	..	..	2	..	..	1
Stabbing	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Throwing from heights	”	..	1	..	..	..	..	”	..	..	..	..	..	..
Shooting	”	..	..	..	..	1	..	”	..	..	..	..	2	..
Poisoning	”	1	1	2	..	..	1	”	..	..	2	..	..	2
Drowning	18	..	..	1	3	1	..	25	..	1	1	..	..	..
Hanging	”	..	2	..	..	1	..	”	..	..	..	1	2	..
Cutting throat......	”	..	1	1	..	..	..	”	..	..	1	..	..	..
Stabbing	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Throwing from heights	”	..	..	..	..	..	..	”	..	..	1	1	..	..
Shooting	”	..	..	..	..	..	..	”	1	..	1	..	..	..
Poisoning	”	3	..	..	2	2	1	”	..	..	..	1	3	..
Drowning	19	..	4	..	1	..	1	26	..	2	1	1	..	1
Hanging	”	..	1	1	1	..	..	”	2	..	2	..	..	..
Cutting throat......	”	..	..	..	..	..	..	”	1	..	1	2	..	1
Stabbing	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Throwing from heights	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Shooting	”	..	..	1	..	..	..	”	1	..	..	..	..	..
Poisoning	”	..	2	2	2	..	2	”	2	1	..	..	1	..
Drowning	20	..	..	..	..	..	1	27	..	..	..	1	..	1
Hanging	”	1	..	..	1	2	..	”	1	..	1	..	..	1
Cutting throat......	”	..	..	..	..	..	..	”	..	..	2	..	1	..
Stabbing	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Throwing from heights	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Shooting	”	..	..	..	..	1	..	”	1	..	1	..	..	..
Poisoning	”	..	..	1	1	..	1	”	..	..	..	1	1	1
Drowning	21	..	1	..	..	..	1	28	..	..	..	..	..	1
Hanging	”	1	2	1	..	..	..	”	1	..	1	..	1	..
Cutting throat......	”	..	..	1	..	..	1	”	..	2	1	1	1	..
Stabbing	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Throwing from heights	”	..	..	..	..	..	..	”	..	..	..	..	..	1
Shooting	”	..	..	..	..	1	..	”	..	..	..	..	..	..
Poisoning	”	..	1	..	1	2	2	”	1	2	1	2	..	..
Drowning	22	1	..	..	1	..	..	29	..	1	..	..	..	1
Hanging	”	2	..	3	1	..	..	”	1	..	..	1	..	..
Cutting throat......	”	..	1	..	..	2	..	”	..	..	..	..	3	..
Stabbing	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Throwing from heights	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Shooting	”	..	..	..	..	..	..	”	..	..	..	..	1	..
Poisoning	”	1	..	..	1	..	1	”	..	..	..	..	..	1
Drowning	23	..	..	..	3	..	..	30	..	1	..	1	..	..
Hanging	”	2	..	1	1	1	..	”	1	..	..	..	2	..
Cutting throat......	”	..	..	.	1	..	1	”	1	..	2	..	1	..
Stabbing	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Throwing from heights	”	..	..	..	..	..	1	”	..	..	..	..	..	..
Shooting	”	..	..	..	..	2	..	”	..	..	..	..	..	..
Poisoning	”	2	1	..	1	..	..	”	1	1	2	2	1	..

Committed by	Age.	1846		1847		1848		Age.	1846		1847		1848	
		M.	F.	M.	F.	M.	F.		M.	F.	M.	F.	M.	F.
Drowning	31	..	..	..	..	..	..	38	..	..	..	..	..	1
Hanging	”	..	..	..	..	3	..	”	2	2	2	..	..	..
Cutting throat	”	..	..	1	1	1	..	”	1	1	2	..	2	..
Stabbing	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Throwing from heights	”	1	..	..	..	..	..	”	1	..	..	..	..	..
Shooting	”	..	..	..	..	..	..	”	1	..	1	..	..	..
Poisoning	”	..	1	..	..	..	1	”	..	..	..	..	..	..
Drowning	32	1	..	1	..	1	2	39	1	..	..	..	..	..
Hanging	”	..	1	1	..	..	..	”	2	..	1	..	3	..
Cutting throat	”	..	..	1	..	3	..	”	1	..	1	..	..	..
Stabbing	”	..	..	..	..	..	..	”	..	..	1	..	..	..
Throwing from heights	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Shooting	”	..	..	1	..	..	..	”	1	..	..	..	..	..
Poisoning	”	..	3	..	..	..	1	”	1	1	..	..	1	1
Drowning	33	..	..	..	1	..	..	40	..	..	..	..	..	..
Hanging	”	1	1	..	..	4	..	”	2	2	..	..	3	..
Cutting throat	”	1	..	1	..	3	1	”	2	1	3	..	3	..
Stabbing	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Throwing from heights	”	..	..	..	..	..	..	”	..	..	..	..	..	1
Shooting	”	..	..	..	..	..	..	”	..	..	..	..	1	..
Poisoning	”	2	..	1	1	..	..	”	..	..	1	..	1	1
Drowning	34	2	..	..	..	..	..	41	..	..	1	..	..	..
Hanging	”	1	2	1	..	1	..	”	2	1	3	..	1	..
Cutting throat	”	1	..	..	1	3	1	”	1	..	1	..	2	..
Stabbing	”	..	..	..	..	..	..	”	..	..	..	1	..	..
Throwing from heights	”	..	..	..	..	..	1	”	..	..	..	..	..	..
Shooting	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Poisoning	”	..	..	..	1	1	..	”	1	1	..	..	..	1
Drowning	35	1	..	..	..	..	..	42	..	2	..	..	1	1
Hanging	”	2	1	..	..	5	1	”	2	3	1	..	..	..
Cutting throat	”	..	1	..	1	1	..	”	2	1	..	2	1	..
Stabbing	”	..	..	..	..	1	..	”	..	..	..	..	..	..
Throwing from heights	”	..	..	..	1	..	..	”	..	1	..	..	..	..
Shooting	”	..	..	..	..	..	..	”	..	..	2	..	..	..
Poisoning	”	1	2	1	..	..	..	”	1	..	..	..	1	..
Drowning	36	..	1	1	..	..	..	43	1	..	..	..	..	..
Hanging	”	..	..	..	1	1	..	”	2	..	..	1	1	..
Cutting throat	”	..	..	..	1	3	..	”	..	1	..	1	1	..
Stabbing	”	..	..	..	..	..	..	”	1	..	..	..	..	..
Throwing from heights	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Shooting	”	..	..	..	..	..	..	”	2	..	..		..	..
Poisoning	”	..	..	2	..	1	..	”	..	..	..	..	..	..
Drowning	37	1	..	1	..	2	..	44	..	..	..	..	..	..
Hanging	”	3	1	2	..	1	1	”	2	1	1	1	2	..
Cutting throat	”	3	..	..	..	2	..	”	1	..	1	..	1	..
Stabbing	”	..	..	..	..	..	..	”	1	..	..	..	..	..
Throwing from heights	”	..	..	..	..	..	..	”	1	..	..	..	..	..
Shooting	”	..	..	..	..	1	..	”	..	..	..	..	..	..
Poisoning	”	..	..	2	1	1	..	”	1	1	1	..	1	1

Committed by	Age.	1846		1847		1848		Age.	1846		1847		1848	
		M.	F.	M.	F.	M.	F.		M.	F.	M.	F.	M.	F.
Drowning	45	1	...	...	...	1	...	52	...	...	...	...	...	...
Hanging	„	1	...	6	...	1	...	„	1	...	2	1	2	1
Cutting throat	„	1	...	2	...	1	...	„	1	...	2	...	2	...
Stabbing	„	...	...	...	...	...	...	„	...	...	...	...	...	...
Throwing from heights	„	...	...	...	...	1	1	„	...	...	...	...	...	...
Shooting	„	...	..	...	...	...	...	„	...	...	...	...	...	...
Poisoning	„	...	...	...	...	4	...	„	...	...	...	2	1	1
Drowning	46	1	1	1	...	...	1	53	...	...	...	...	...	...
Hanging	„	1	1	2	...	1	...	„	3	...	...	...	2	..
Cutting throat	„	2	...	4	...	...	...	„	1	...	...	...	2	...
Stabbing	„	...	...	...	...	...	...	„	...	...	...	...	1	...
Throwing from heights	„	1	...	...	1	...	...	„	...	...	...	...	...	...
Shooting	„	...	...	...	...	...	...	„	...	...	1	...	...	...
Poisoning	„	...	...	...	...	...	...	„	...	...	...	...	...	...
Drowning	47	...	...	1	1	1	...	54	...	...	1	...	...	...
Hanging	„	1	...	3	1	1	1	„	...	...	...	...	...	...
Cutting throat	„	1	...	2	1	...	1	„	3	...	4	...	1	...
Stabbing	„	...	...	...	...	...	...	„	...	...	...	...	...	...
Throwing from heights	„	...	...	...	...	...	...	„	...	1	...	...	...	...
Shooting	„	...	...	...	...	1	..	„	...	...	...	...	1	...
Poisoning	„	...	1	...	...	...	...	„	...	...	...	...	...	...
Drowning	48	...	...	...	...	1	...	55	...	1	...	...	...	1
Hanging	„	1	...	...	...	1	1	„	2	1	4	...	2	...
Cutting throat	„	1	...	2	1	...	...	„	...	...	...	...	...	...
Stabbing	„	...	...	...	...	...	...	„	...	...	...	...	...	...
Throwing from heights	„	...	...	...	...	...	...	„	...	...	1	...	..	...
Shooting	„	...	...	...	...	...	...	„	...	...	...	...	...	...
Poisoning	„	...	...	3	...	...	1	„	1	...	...	...	...	1
Drowning	49	1	...	1	...	2	1	56	2	1	1	...	...	...
Hanging	„	3	1	...	2	1	...	„	1	...	...	...	...	...
Cutting throat	„	1	...	1	...	2	...	„	2	...	...	...	...	...
Stabbing	„	...	...	...	...	...	...	„	...	...	...	...	...	...
Throwing from heights	„	...	...	...	1	...	...	„	...	...	...	...	...	...
Shooting	„	...	...	...	...	...	...	„	...	...	...	...	...	...
Poisoning	„	...	...	1	1	...	...	„	...	1	...	...	1	...
Drowning	50	...	1	...	...	1	...	57	1	...	...	...	...	...
Hanging	„	1	1	...	...	1	...	„	1	...	1	...	2	...
Cutting throat	„	1	...	1	...	1	...	„	...	...	...	...	1	...
Stabbing	„	...	...	...	...	...	...	„	...	1	...	...	...	...
Throwing from heights	„	...	...	...	...	...	...	„	...	...	...	...	...	...
Shooting	„	...	...	...	...	...	...	„	...	...	...	...	...	...
Poisoning	„	1	...	1	...	1	1	„	...	...	...	...	1	...
Drowning	51	...	1	1	...	...	...	58	...	...	...	1	...	1
Hanging	„	...	...	1	1	1	...	„	3	...	1	...	1	...
Cutting throat	„	...	...	2	...	1	1	„	1	...	...	2	1	...
Stabbing	„	...	...	...	...	...	...	„	...	1	...	...	...	...
Throwing from heights	„	...	...	...	...	...	...	„	...	...	...	...	...	...
Shooting	„	...	...	...	...	...	...	„	...	...	...	...	...	...
Poisoning	„	...	1	2	...	...	...	„	...	...	...	1	...	...

Committed by	Age.	1846		1847		1848		Age.	1846		1847		1848	
		M.	F.	M.	F.	M.	F.		M.	F.	M.	F.	M.	F.
Drowning	59	..	..	..	..	..	..	66	..	..	..	..	..	..
Hanging	”	..	..	..	1	2	1	”	1	..	..	..	1	..
Cutting throat	”	1	1	1	..	..	..	”	..	..	..	..	..	..
Stabbing	”	1	..	..	..	..	..	”	..	..	..	..	..	..
Throwing from heights	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Shooting	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Poisoning	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Drowning	60	1	..	..	..	..	..	67	..	1	..	..	..	..
Hanging	”	..	..	2	..	2	1	”	..	1	..	1	..	..
Cutting throat	”	2	..	1	..	2	1	”	1	..	1	..	..	..
Stabbing	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Throwing from heights	”	..	..	..	..	..	..	”	..	..	..	..	1	..
Shooting	”	1	..	..	..	1	..	”	..	..	..	..	1	..
Poisoning	”	..	..	..	1	1	..	”	..	..	1	..	..	..
Drowning	61	1	..	..	..	..	..	68	..	..	..	..	..	..
Hanging	”	..	3	..	..	1	..	”	..	..	1	..	1	..
Cutting throat	”	..	..	..	..	..	..	”	2	..	1	..	..	..
Stabbing	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Throwing from heights	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Shooting	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Poisoning	”	..	..	..	..	1	..	”	..	..	..	..	..	..
Drowning	62	..	..	1	..	..	..	69	..	..	..	..	..	..
Hanging	”	1	..	..	..	..	..	”	..	..	2	..	..	..
Cutting throat	”	2	1	..	..	..	..	”	..	..	..	..	..	..
Stabbing	”	1	..	..	..	..	..	”	1	..	..	..	..	..
Throwing from heights	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Shooting	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Poisoning	”	..	..	..	..	..	..	”	..	..	..	1	..	..
Drowning	63	..	..	1	..	..	..	70	..	..	..	..	..	..
Hanging	”	1	..	1	1	..	1	”	..	..	1	1	..	..
Cutting throat	”	2	..	1	..	..	1	”	..	..	..	..	..	..
Stabbing	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Throwing from heights	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Shooting	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Poisoning	”	..	..	..	1	..	..	”	..	..	2	..	..	..
Drowning	64	..	..	..	..	1	1	71	..	..	..	..	..	..
Hanging	”	..	2	3	..	..	1	”	..	..	..	..	..	..
Cutting throat	”	1	..	1	..	..	..	”	..	..	..	..	..	..
Stabbing	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Throwing from heights	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Shooting	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Poisoning	”	..	..	..	..	..	..	”	..	1	..	..	..	..
Drowning	65	..	1	..	..	..	..	72	..	..	..	..	..	..
Hanging	”	..	..	..	..	1	..	”	..	..	..	..	3	..
Cutting throat	”	..	..	2	..	..	..	”	..	..	1	..	1	..
Stabbing	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Throwing from heights	”	..	..	..	..	..	..	”	..	..	..	..	..	..
Shooting	”	..	..	..	..	..	..	”	..	..	..	..	1	.
Poisoning	”	..	..	..	..	..	..	”	..	..	..	1	..	..

Committed by	Ages.	1846		1847		1848		Ages.	1846		1847		1848	
		M.	F.	M.	F.	M.	F.		M.	F.	M.	F.	M.	F.
Drowning	73	. .	. .	. .	. .	. .	. .	80	. .	. .	. .	. .	. .	. .
Hanging	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Cutting throat	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Stabbing	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Throwing from heights	„	. .		. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Shooting	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Poisoning	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	1
Drowning	74	. .	. .	. .	. .	. .	. .	81	. .	. .	. .	. .	. .	. .
Hanging	„	2	. .	1	. .	1	1	„	. .	. .	. .	. .	. .	. .
Cutting throat	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Stabbing	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Throwing from heights	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Shooting	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Poisoning	„	. .	. .	1	. .	. .	. .	„	. .	. .	. .	. .	. .	1
Drowning	75	. .	. .	. .	. .	. .	. .	82	. .	. .	. .	. .	. .	. .
Hanging	„	. .	. .	. .	. .	. .	. .	„	1	. .	. .	. .	. .	. .
Cutting throat	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Stabbing	„	. .	. .	. .	. .	. .	. .	„	1	. .	. .	. .	. .	. .
Throwing from heights	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Shooting	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Poisoning	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Drowning	76	1	. .	. .	. .	. .	. .	83	. .	. .	. .	. .	. .	. .
Hanging	„	. .	. .	1	. .	. .	. .	„	1	. .	. .	. .	. .	. .
Cutting throat	„	1	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Stabbing	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Throwing from heights	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Shooting	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Poisoning	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Drowning	77	. .	. .	. .	. .	. .	. .	84	. .	. .	. .	. .	. .	. .
Hanging	„	. .	. .	. .	. .	. .	1	„	1	. .	1	. .	1	. .
Cutting throat	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Stabbing	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Throwing from heights	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Shooting	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Poisoning	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Drowning	78	. .	. .	. .	. .	. .	. .	85	. .	. .	. .	. .	. .	. .
Hanging	„	. .	. .	1	1	1	. .	„	. .	. .	. .	. .	. .	. .
Cutting throat	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Stabbing	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Throwing from heights	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Shooting	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Poisoning	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Drowning	79	. .	. .	. .	. .	. .	. .	Not	. .	. .	1	. .	. .	. .
Hanging	„	. .	. .	1	. .	. .	. .	stated.	. .	. .	1	. .	. .	. .
Cutting throat	„	. .	. .	1	. .	. .	. .	„	. .	1	1	. .	. .	. .
Stabbing	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Throwing from heights	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .
Shooting	„	. .	. .	. .	. .	. .	. .	„	1	. .	. .	. .	. .	. .
Poisoning	„	. .	. .	. .	. .	. .	. .	„	. .	. .	. .	. .	. .	. .

Suicide by poisons present a wide and important field for research, as bearing on medico-legal investigation; and the following table shows those chiefly used at different ages:—

TABLE III.—*Ascertained Suicides, London,* 1846–48.

AGES.	BY POISONING WITH																	AGES.
	Oxalic Acid.		Hydrocyanic Acid.		Arsenic.		Opium.		Sulphuric Acid.		Corrosive Sublimate.		Other Poisons.		All Poisons.			
	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	Both.	
10 to 14	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	10 to 14
15 „ 19	1	2	4	3	2	3	1	2	..	..	1	..	1	1	10	11	21	15 „ 19
20 „ 24	..	3	4	3	2	5	..	..	..	..	1	1	1	..	8	12	20	20 „ 24
25 „ 29	2	3	3	..	..	1	3	3	..	1	..	..	1	1	9	9	18	25 „ 29
30 „ 34	1	3	3	4	1	2	2	1	..	..	1	1	..	..	8	11	19	30 „ 34
35 „ 39	1	2	3	1	3	..	..	2	1	...	1	..	1	..	10	5	15	35 „ 39
40 „ 44	3	1	3	2	1	2	1	..	..	..	..	..	..	..	8	5	13	40 „ 44
45 „ 49	..	1	5	..	1	1	1	..	1	1	..	..	..	..	8	3	11	45 „ 49
50 „ 54	..	..	1	1	1	1	3	1	..	2	1	..	..	..	6	5	11	50 „ 54
55 „ 59	..	1	1	..	..	..	2	..	..	1	..	..	..	1	3	3	6	55 „ 59
60 „ 64	..	..	1	..	1	1	..	1	..	..	..	..	..	..	2	2	4	60 „ 64
65 „ 69	..	..	1	..	..	..	..	..	..	..	..	..	..	1	1	1	2	65 „ 69
70 „ 74	..	..	3	1	..	..	..	..	..	..	..	..	..	..	3	1	4	70 „ 74
75 „ 79	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	75 „ 79
80 „ 84	..	..	..	..	..	1	..	1	..	..	..	..	..	..	..	2	2	80 „ 84
Total ...	8	16	32	15	12	17	13	11	2	5	5	2	4	4	76	70	146	...Total.

(To be continued in our next Number.)

Increase of Fire Insurances in Great Britain from 1844 *to* 1850.

THE progress of assurance in this branch of business in France has been pointed out, in another article in this Number, as so remarkable within recent years, that it seems desirable to have some means of comparison with what has been effected in our own country. We have therefore prepared the following tables, which have been deduced from the duty paid to Government by the different Offices, and the returns of which are annually printed by the order of the House of Commons.

The increase shown in the following totals of all the business is highly satisfactory. From 1844 to 1848 the total increase was 6·22 per cent., or 1·55 per cent. per annum; from 1844 to 1850 10·39 per cent., or 1·73 per cent. per annum; and in the last two years of the period 3·92 per cent., or 1·96 per cent. per annum.

Fire Insurances.

	In 1844.	In 1848.	In 1850.
In England:—	£	£	£
Town Offices . . .	465,318,000	493,870,967	521,345,858
Do. farming stock exempt	32,402,244	35,911,860	36,621,997
Country Offices . . .	159,143,000	177,192,466	181,025,183
Do. farming stock exempt	22,525,328	22,962,035	20,540,249
In Scotland	45,960,000	42,500,721	44,280,855
Do. farming stock exempt	4,272,556	4,138,528	4,168,057
In Ireland	33,453,000	23,901,266	34,434,636
Do. farming stock exempt	500,534	582,459	475,124
	£763,574,662	£811,060,302	£842,891,959

From this comparison, it will appear that in England the increase in the Town Offices has been 6·1 per cent. in the four years from 1844 to 1848, or rather more than 1½ per cent. per annum; 12 per cent. in the six years from 1844 to 1850, or 2 per cent. per annum. The greatest increase has been in the last two years, which taken by themselves = 2·785 per cent. per annum.

In the Country Offices, the rate of increase in the four years was 2·83 per cent.; in the six years, only 2·29 per cent. per annum; and in the last two years still less, being little more than 1·08 per cent. in each year.

On the other hand, the insurance of farming stock, which had increased from 1844 to 1848 by 7·14 per cent., or 1·785 per cent. per annum, had in the six years to 1850 increased only by 4·1 per cent., or there had actually been a falling off in the last two years, 1849 and 1850, of 2·9 per cent. The amounts insured were, in 1844, £54,927,572; in 1848, £58,873,895; and in 1850, only £57,172,246.

The insurances in Ireland have increased but slowly. In the first four years of the period named, the increase is but 1·61 per cent, or ·4 per cent. per annum; and in the six years, 2·90 per cent., or ·48 per cent. per annum; and in the last two of these years, ·65 per cent. per annum.

The insurances on farming stock in Ireland, which had increased from £500,534. in 1844 to £582,459. in 1848, had in 1850 fallen even below the amount in the first period, being reduced to £475,124.

In Scotland there is a considerable reduction at both the latter dates when compared with the totals in 1844; but the business bears the satisfactory appearance of recovering from the depression, though there is still a deficiency of nearly £1,680,000. in the general insurances, and £104,500. in those on farming stock. The proportions of the former in 1844, 1848, and 1850 are nearly as 100, 92·5, and 96·3.

Table showing a Comparison of the Business, deduced from the Returns of the Duty for 1848 *and* 1850, *in each Fire Insurance Company in Great Britain and Ireland.*

Town Offices.	Date.	Sums insured in England.	Farming Stock exempt.	Irish Insurances.	Do. Farming Stock exempt.	Total 1850.	Total 1848.
		£	£	£	£	£	£
Alliance	1824	29,696,822	3,120,592	2,413,885	50,330	35,281,629	24,991,944
Anchor	1842	793,613	11,303	4,825	..	809,741	..
Atlas	1808	23,359,303	1,059,699	2,946,405	63,225	27,428,632	25,828,099
British (late Architects')	1847	1,565,810	12,095	..	..	1,577,905	691,287
British Empire	1848	1,397,005	*Nil*	3,550	..	1,400,555	417,883
Church of England	1840	2,182,500	42,918	84,797	975	2,311,190	2,282,148
County	1807	34,831,735	7,111,316	1,071,394	32,310	43,046,755	41,826,106
Defender	1842	3,844,616	49,000	..	..	3,893,616	2,845,230
Equitable	1850	206,466	13,975	57,875	2,650	280,966	..
General	1837	7,108,855	119,682	..	..	7,228,537	7,371,591
Globe	1803	21,931,139	1,133,924	1,568,269	15,915	24,649,247	23,488,293
Guardian	1821	20,912,010	347,180	..	..	21,259,190	21,030,263
Hand-in-Hand	1696	6,845,558	17,125	..	..	6,862,683	6,462,324
Imperial	1803	30,211,203	813,457	1,516,245	28,225	32,569,130	32,079,430
Law	1845	12,811,178	129,580	..	..	12,940,758	10,359,400
Legal and Commercial	1847	5,267,310	65,396	..	..	5,332,706	3,244,756
London Corporation	1720	14,870,436	370,856	639,978	2,250	15,883,520	14,060,374
Monarch (late Licensed Victuallers')	1835	7,522,946	44,265	458,520	1,950	8,027,681	7,428,315
National Mercantile	1848	2,074,322	1,500	49,780	..	2,125,602	..
Phœnix	1782	80,273,555	4,319,723	812,047	3,671	85,408,996	86,113,754
Preserver	1843	25,166	*Nil*	..	..	25,166	37,933
Royal Exchange	1720	50,113,328	4,511,182	3,706,803	58,519	58,389,832	57,650,320
Royal Farmers'	1839	8,508,140	5,105,468	40,433	1,000	13,655,041	14,504,870
Star	1845	3,407,069	115,770	..	..	3,522,839	2,703,064
Sun	1710	120,765,485	7,769,383	5,153,196	51,655	133,739,719	133,972,928
Union	1714	15,450,378	303,308	792,569	6,050	16,552,305	16,107,103
Westminster	1717	15,369,910	33,300	..	..	15,403,210	14,810,417
		521,345,858	36,621,997	21,320,571	318,725	579,607,151	550,307,832

Country Offices.	Date.	Sums insured in England.	Farming Stock exempt.	Irish Insurances.	Do. Farming Stock exempt.	Total 1850.	Total 1848.
		£	£	£	£	£	£
Birmingham	1805	8,422,807	674,976	..	..	9,097,783	8,547,097
District Birmingham	1834	4,385,820	285,637	..	..	4,671,457	4,472,885
Brighton and Sussex	1850	263,833	*Nil*	..	..	263,833	..
Essex Economic	1824	2,698,045	521,648	..	..	3,219,693	3,038,243
Essex and Suffolk	1802	4,023,637	1,169,459	..	..	5,193,096	5,203,922
Hants, Sussex, and Dorset	1803	1,725,860	198,903	..	..	1,924,763	1,813,338
Halifax, Bradford, and Keighley	1845	2,852,150	88,465	..	..	2,940,615	2,585,207
Kent	1802	8,517,660	980,658	70,883	..	9,569,201	9,415,535
Kent Mutual	1846	1,596,653	*Nil*	..	..	1,596,653	794,727
Leeds and Yorkshire	1824	9,593,640	446,402	..	..	10,040,042	9,555,919
Liverpool	1836	8,915,413	84,705	274,422	..	9,274,540	8,700,666
Manchester	1824	12,819,222	373,365	806,627	11,020	14,010,234	12,717,265
Newcastle-on-Tyne	1783	3,966,628	431,095	..	..	4,397,723	4,515,869
North of England	1844	1,707,210	202,216	134,058	..	2,043,484	1,878,713
Norwich Equitable	1829	1,664,933	250,476	..	..	1,915,409	1,897,534
Norwich Union	1797	48,930,393	9,428,436	383,817	7,820	58,750,466	58,218,041
Nottingham and Derby	1835	2,109,193	210,056	..	..	2,319,249	2,342,281
Preston and North Lancashire	..	..	..	..	..	..	238,435
Royal Insurance, Liverpool	1845	9,360,110	81,637	559,577	3,113	10,004,437	7,136,556
Salop	1780	2,462,788	522,831	..	..	2,985,619	2,930,855
Sheffield	1808	1,558,265	73,580	..	..	1,631,845	1,635,322
Shropshire and North Wales	1836	1,140,290	338,760	..	..	1,479,050	1,455,818
Suffolk Amicable (transferred to the Alliance)	..	..	..	..	..	..	10,032,831
West of England	1807	30,917,460	1,113,304	4,005,085	61,246	36,097,095	33,005,631
Yorkshire	1824	11,393,173	3,063,640	..	..	14,456,818	13,756,455
		181,025,183	20,540,249	6,234,469	83,199	207,883,100	205,889,145

Offices.	Date.	Sums insured.	Farming Stock exempt.	Irish Insurances.	Do. Farming Stock exempt.	Total 1850.	Total 1848.
SCOTCH.		£	£	£	£	£	£
Aberdeen	1825	2,890,919	369,116	58,555	..	3,318,590	3,271,865
Bon Accord (transferred to the Northern)		..	..	..	..	..	581,385
Caledonian	1805	5,404,575	592,410	..	..	5,996,985	5,767,780
Forfarshire and Perthshire . . .	1823	1,518,614	199,180	..	..	1,717,794	1,648,106
Friendly		..	..	..	..	..	489,830
Hercules (transferred to Scottish Union)		11,062	2,680	..	..	13,742	4,408,996
Morayshire	1840	101,044	53,697	..	..	154,741	104,669
National	1841	2,851,005	311,914	..	..	3,162,919	3,165,510
North British	1809	11,457,022	818,383	159,608	600	12,435,613	11,193,524
Northern	1836	3,878,222	493,955	229,285	300	4,601,762	3,520,836
North of Scotland		..	..	..	..	..	193,190
Scottish Union	1824	16,168,392	1,326,722	..	..	17,495,114	13,787,419
		44,280,855	4,168,057	447,448	900	48,897,260	48,133,110
				£	£	£	£
National (of Ireland)		..	..	3,898,183	33,115	3,931,298	4,021,797
Patriotic (ditto)		..	..	2,533,965	39,185	2,573,150	2,708,418
				6,432,148	72,300	6,504,448	6,730,215
TOTALS.		£	£	£	£	£	£
English Offices . { Town . .		521,345,858	36,621,997	21,320,571	318,725	579,607,151	550,307,832
English Offices . { Country . .		181,025,183	20,540,249	6,234,469	83,199	207,883,100	205,889,145
Scottish		44,280,855	4,168,057	447,448	900	48,897,260	48,133,110
Irish		..	..	6,432,148	72,300	6,504,448	6,730,215
		746,651,896	61,330,303	34,434,636	475,124	842,891,959	811,060,302

Premiums for Maritime Assurances, settled by the Assurance Brokers at Paris (February 1850).

Coasting.	Havre, Rouen, ⅛ per cent. more. (*a*)	Nantes or Bordeaux.	Marseille or Cette.
Baltic	⅞ (*b*)	1⅛ (*b*)	1¾ (*b*)
From the Mediterranean to the Baltic (Departures from January to March)	..	..	2½
The Categat, Norway, West Coast of Denmark	1 (*b*)	1¼ (*b*)	1¾ (*b*)
Do. do. (Departures from the Mediterranean from January to March)	..	..	2¼
Hamburgh and Bremen	1 (*b*)	1¼ (*b*)	1¾ (*b*)
Do. do. (Departures from the Mediterranean in January and February)	..	..	2¼
Hamburgh, by Steam (Departures up to Feb.)	1	..	..
Do. do. (do. March)	¾	..	..
Scotland, by the North Sea	1½	2	2½
Amsterdam, Rotterdam, Antwerp, and East Coast of England, by sailing-vessels	1¼	1¾	2¼
Do. do. steam do.	⅝	..	..
England on the English Channel, Dunkirk, Boulogne, Valéry-sur-Somme, by sailing-vessels	1	1½	2
Do. do. by steam-vessels	½	..	..
Le Hâvre, Dieppe, Caen, Morlaix, and intermediate Ports	1	1⅜	1⅛
Brest	1⅛	1⅛	1¾
Saint George's Channel and Ireland	1⅛	1⅛	2¼
West Coast of Scotland	1¾	1¾	2½
Bordeaux, L'Orient, Nantes, Bayonne (⅛ per cent. less on *spirituous liquors* by little coasting, ¼ by great coasting)	1⅜	1	1¾
St. Sebastien, Corunna, Oporto, Lisbon, Cadiz (Steam ¾ per cent.)	1⅜	1⅛	1⅝
Seville, Malaga, Alicant (½ per cent. more on *lead;* ⅛ per cent. less on *oil;*—premium by steam ⅞ per cent.)	1½	1⅜	1¼
Marseille, Barcelona, Port Vendre, Cette, Genoa, Leghorn (⅛ per cent. less on *spirituous liquors, soap,* and *oil,* by little coasting; ¼ by great coasting)	1⅞	1¾	1
Algiers and Oran	1⅞	1¾	1¾
Other Ports of Algeria	2½	2½	2½
Morocco	2	2	2
Naples, Sicily, Malta, Bari (⅛ per cent. less on *oil*)	2	2	1¼
Venice, Trieste, Fiume (⅛ per cent. less on *oil*)	2¾	2¾	2
Tunis, Morea, Candia, Salonica, Constantinople, Smyrna, Cyprus, Egypt (by steam, by Marseille, ¾ per cent.)	2½	2½	1½
Black Sea	2 (*b*)	2 (*b*)	1¼ (*b*)

(*a*) The increase of ⅛ per cent., when Rouen is the point of departure or destination instead of Havre, is also applicable to the ports in the departments of La Somme, Le Pas de Calais, and Le Nord, for voyages from these ports to those of the West or of the South, and *vice versâ.*

(*b*) See in another part the increase of premium for departure after the 15th or 31st August, and before the 1st of April.

Long Voyages.	Havre. (*a*) Outward.	Nantes or Bordeaux. (*c*) Home.
From Newfoundland to the French Antilles, with or without putting into port (on *cod*, 1½; the same, free of average, 1¼)	..	..
For La Réunion (2¼; free of average, 1¾)	..	..
Newfoundland	1½	1½
New York (premium on *specie*, ¾ per cent.)	(Specie ¾) ⅞	1¼
United States, seaboard (tobacco ¼ per cent. more; specie, ⅞ per cent.)	(Specie ¾) 1⅛	1¼
New Orleans (tobacco ¼ per cent. more; specie, 1¼ per cent.)	(Do. 1) 1½	1
Vera Cruz (specie, by steam-vessels, 1½; by sailing-vessels, 1¾)	2½	3½
Other Ports of Mexico on the Gulf (specie, by steam-vessels, 1½; by sailing-vessels, 2)	3	3½
Havannah and other Ports of Cuba (specie 1¼; departure in January)	1¾	2½
Outward (1; in February and March)	1¾	2¼
Hayti, with or without putting into St. Thomas (Departure in January)	1¾	3
Do. (do. in February and March)	1¾	2½
Porto Rico (do. do.)	1½	2
Martinico (specie on return, ⅞ per cent.)	(Specie ¾) 1⅛	(*d*) 1½
Gaudaloupe (Le Monte excepted), St. Thomas, &c. (do. do. ⅞ do.)	(Specie ¾) 1⅛	1½
Le Monte	2	2½
Gulf of Honduras, Belleisle, Isabel, Truxillo, St. Thomas de Guatemala	2¾	4
Terra Firma (reduction on specie, 30 per cent.; Honda, ¾ per cent. more on merchandise; Bogota, ½ per cent. in addition)	(Specie 1¼) 1¾	2½
Cayenne	1¼	1½
La Para	2	3
Maranham	1¾	2¼
Monte Video	1½	2
Buenos Ayres, Rio Grande de San Pedro, or du Sud	1¾	2¼
Valparaiso	2	2¼
Intermediate Ports (outwards, ¼ per cent. less, direct)	2¼	2½
Lima do. ½ do.	2½	2¾ (*e*)
Guayaquil do. ½ do.	2¾	3
Central America do. ½ do.	3	3¼
(*f*) San Blas, Mazatlan, Guaymas (do. ½ do.; premium on specie, by trading-vessel, 2¼; by ship of war, 1¼)	3¼	3½
San Francisco (do., 3 do.; premium on specie, by trading vessels, 1¼; by steamers	..	..
Panama (2 per cent.)	3½	3¾

(*c*) If, instead of these three ports, the point of departure or destination is Marseille, or another port of France on the Mediterranean, the premium is increased by ¼ per cent.

Increase:—if, instead of these three ports, the destination is Genoa, Leghorn, or Naples, ½ per cent.; Trieste, ¾ per cent.; Antwerp, Amsterdam, or London, ¼ per cent.; Hamburgh, ¾ per cent.

(*d*) See elsewhere the increased rates for *winter*.

(*e*) Half per cent. more on *saltpetre*, *cocoa*, and *guano*; *specie*, either by trading-vessel and by Cape Horn, or by steam-vessel and by Panama, 1¾; by ship of war, 1¼.

(*f*) Half per cent. more, both homeward and outward, on vessels rated below 5. S. L.

Long Voyage.	Havre. (*a*) Outward.	Nantes or Bordeaux. (*c*) Home.
Rio Janeiro, Bahia, Pernambuco (reduction on *specie* and *precious stones*, rough, 30 per cent.; increase on *sugar* and *leather*, ½ per cent.)	1⅛	1½
Marquesas and Society Islands (putting into Valparaiso, ½ per cent. more)	2¾	3
From Chili or Peru to the above, 1¾ per cent.	2¾	3
China (½ per cent. more on *tobacco* and *cigars*)	3	..
Manilla do. do. do.	2¾	2¾
Sincapoor	2½	2½
Sunda Islands (¼ per cent. less on *indigo*)	2¼	2¼
Ceylon, Coasts of Malabar and Coromandel (½ per cent. more on *rice*, *grain*, *seeds*, and *saltpetre*)	2	2
Calcutta, Montmein, Akyab (do. do. do.; ¼ per cent. less on *indigo*)	2¼	2¼
Island of La Réunion (Bourbon) and Maurice (Maurice ⅛ per cent less; ¼ per cent. more putting into the Cape; ¼ per cent. less *coffee* and *cloves;* ½ per cent. more on certain articles homewards)	1¾	(*d*) 2¾
From La Réunion to Calcutta: merchandise, 1½ (*d*); specie, 1¼ per cent. (*d*)	..	..
Calcutta to La Réunion (1¾; *rice*, *grain*, and *seeds*, 2¼ per cent.)	..	..
Senegal	2	2½
Goree	1½	2
Gambia	2¼	3

Grain, Seeds, and Flour.

The undermentioned premiums refer to *flour* or *meal* in *sacks,* and to grain and seeds *loose,* except *hemp-seed.* They are subject to a reduction of ¼ per cent. upon grain or seeds in sacks, as well as upon hemp-seed *loose* or in *sacks. Meal in barrels,* as specially charged. The premium for ordinary merchandise is applicable to *seeds in barrels.*

		Havre, Rouen, ⅛ per cent. more. (*a*)	Nantes or Bordeaux.	Marseille or Cette.
Categat, East Coast of Denmark, Hamburg, and Bremen		(*b*) 1¼	(*b*) 1½	(*b*) 2½
Amsterdam, Rotterdam, Antwerp, and East Coast of England, North of London		1¾	2¼	3¼
London		1½	2	3
French Ports in the Channel		1½	1¾	2½
Nantes, Bordeaux, and Bayonne		1¾	1½	2½
Mediterranean		2½	2½	1½ to 2½
Black Sea		(*b*) 3	(*b*) 3	(*b*) 1½
United States of America, on the Ocean	Grain and Seeds	3½	3½	3¾
	Meal in Barrels	2	2	2¼
New Orleans	Grain and Seeds	4	4	4¼
	Meal in Barrels	2¼	2¼	2½

Fisheries.

Whale Fisheries,—7½ per cent. for 18 months; ½ per cent. more for each month longer; 12 per cent. for the entire voyage. To Iceland,—one fishing voyage, 3 per cent.; two do., 5 per cent. To Newfoundland,—see rates below.

	Average guaranteed.	Free of Average.
	PER CENT.	PER CENT.
Outwards to the Bank or the Coast, the risk ending 24 hours after anchoring	1½	$1\frac{15}{100}$
Homewards from the Bank or the Coast, the risk commencing on weighing anchor	1½	$1\frac{15}{100}$
Outwards, and making one fishing voyage, the risk ending on weighing anchor	2	1½
Outwards to the Bank or the Coast, making one fishing voyage, and returning to a port on the Ocean or the Channel	3	2¼
Outwards to the Bank, fishing voyage thence to the Coast, and returning as above	3¼	2¾
Outwards to the Bank, fishing on the East and West Coasts, and returning as above	4	3

Increase.

According to the conditions accorded for the combined voyages, all the increase of premium for putting into ports, &c., are added to the original premium, subject to being finally returned, according to circumstances.

	Average guaranteed.	Free of Average.
	PER CENT.	PER CENT.
Touching at Croisie or l'île de Ré for *salt*	¼	$\frac{2}{10}$
„ St. Ubes do.	½	$\frac{4}{10}$
From the fishing ground to St. Pierre, Miquelon, discharging cargo, and returning for a new fishing	½	$\frac{4}{10}$
From the fishing ground to the Antilles before returning to France	1¼	$\frac{95}{100}$
From the Antilles to France	1½	$1\frac{15}{100}$
Touching to disembark the fishermen, before the return to home port	½	$\frac{40}{100}$
Homewards from Newfoundland or the Antilles, direct to port in the Mediterranean	¼	$\frac{20}{100}$
Touching at any port in the Mediterranean, for each	¼	$\frac{20}{100}$
Returning from the Mediterranean to a port on the Ocean or the Channel	2	1½
First departure from a port, on the Ocean or the Channel, for any other port	1	$\frac{75}{100}$
Putting into any other port on the Ocean or Channel	½	$\frac{40}{100}$
Additional for Rouen or La Somme	¼	$\frac{20}{100}$
Insurance for the Year	7½	5

Insurances on Bodies of Ships for a Term.

	One Year.	Six Months.	
	PER CENT.	PER CENT.	
Voyages to and from Senegal and the Gulf of Mexico	9 to 10	5 to 6	One per cent. with average, or ½ per cent. more free of average, on ships rated below 5. S. 1. 1.
Other long voyages	8 to 10	4½ to 6	
Coasting	7	4	
Free of Average. . Long voyages	8	5 to 6	
Free of Average. . Coasting do.	5	3	
Do., except in cases of *collision* or *running aground*	6	3½	
Steam-vessels, ordinary construction (free of explosion)	6	. .	
Do. iron	5	. .	

If the insurers consent to waive article 4 of the policy,* each voyage outward and homeward in the seas of Europe, to the north of the latitude of Dunkirk, the White Sea and Baltic Sea excepted, from the 1st October to the 31st March, causes an augmentation of premium of 1 per cent. *with average*, and ¾ per cent. *free of average*. This augmentation is reduced to ½ per cent. if the outward voyage has been terminated before the 1st October, or if the return voyage has been commenced after the 31st March.

If the ship goes to the White Sea, the Baltic or the Black Sea, the assured must pay an increase of premium; calculated in proportion to the date of the homeward departure, according to the customary rates of Paris, and equal to that which merchandise would have paid in the same ship.

In case of a reduction of the term after the 31st March, and before the 1st of October, the insurers may claim a minimum of half the premium. This minimum is two-thirds, if the risk ceases after the 30th September, and before the 1st April.

Insurances on Bodies of Ships for the Voyage.

In cases of insurance on the bodies of ships for the voyage, the premiums fixed by the above-mentioned tariff for the merchandise are increased by at least 50 per cent.

River Risks.

Havre to Paris	½	per cent.	Liable to abatement for one or more years.
Rouen to Paris	⅜	”	
Havre to Rouen	⅜	”	
Nantes to Orleans	⅝	”	
Nantes to Paris	¾	”	

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* The form of the French policy will be given in our next Number.

Usages of Paris.—Augmentation of Premiums.

The period of departure may cause the following rates of increase:—

CATEGAT, NORWAY, COAST OF DENMARK, HAMBURG, AND BREMEN,	WHITE SEA,	BALTIC SEA,	BLACK SEA,
Each 15 days.	For every 8 days.	For every 8 days.	Half per cent. for every 10 days.
After the 31st Aug.: in Sept., ¼ per cent.; in Oct., Nov., and Dec., ½ per cent. In departures, from 1st Jan. to 31st Mar., the premium is increased ¼ per cent. for each 15 days from the period of departure to the 1st April. This last rate of increase is not applicable to outward voyages from the Mediterranean to these parts.	After the 15th Aug.: from the 16th Aug. to 30th Sept., ½ per cent.; from 1st Oct. to 31st Dec., 1 per cent.	After the 31st Aug.: from 1st Sept. to 15th Oct., ½ per cent.; from 16th Oct. to 31st Dec., 1 per cent. In departures from 1st Jan. to 31st Mar., the premium is increased by ¼ per cent. for every 8 days from the date of departure to 31st March. The last rate does not apply to voyages from the Mediterranean to the Baltic.	After the 21st Aug., for the Ocean or the Channel; after the 31st Aug., for the Mediterranean, up to 31st Dec. In departures, from the 1st Jan. to 16th April, the premium is increased ½ per cent. for every 10 days from the date of departure to 15th April.
The 15 days count from the 1st to 15th, and 16th to the end of each calendar month.	The 8 days are reckoned from 1st to 8th, 9th to 16th, 17th to 24th, and 25th to the end of each calendar month.		The 10 days are reckoned from 1st to 10th, 11th to 20th, 21st to the end of each calendar month.

In policies on ships unknown, either on *tobacco* and *cigars*, for long voyages, or *grain* and *meal*, the premium and the increase of premium will be augmented 25 per cent. on ships rated 2 T, or below, or not rated. This augmentation will be returned if, on arrival, the ship is rated above 2 T.

Increase of rate for wintering in the Colonies.—An increase of ½ per cent. is claimed for every 15 days of stoppage in the Roads of

St. Pierre Martinique, from 15th July to 15th October.
La Réunion (Bourbon) „ 1st January to 15th April.

The 15 days will count during the voyage from La Réunion to Maurice and back to La Réunion, as well as during the time not at anchor, and on the voyage from one roadstead to another of La Réunion.

In the assurances on the bodies of ships, these augmentations will be the same whether the insurers are responsible or not for averages.

Merchandise on deck is only insured free of particular average, and at a double premium. This rule does not apply to coasting vessels, nor to timber from the North.

In cases of insuring cargoes of *coal,* the rates are increased 50 per cent.

Reduction of Premiums.

The premium and additions thereto will be diminished

20 per cent. on *rails* and *iron-bars* from one part of France to another; on *tallow, copper, tin* and *zinc,* unwrought, as well as in *specie,* and *precious stones* (*rough*), unless they be specially rated; also on *sheet-iron, copper,* and *zinc plates,* when these three articles are stipulated to be *free of particular average for materials.*

25 per cent. in case of insertion of the clause *free of particular average;*	but only on articles from which are excepted *tallow,* the *metals, specie, precious stones* (*rough*), and the objects enumerated in the 1st § of art. 20 of the policy.
33 per cent. in case of insertion of the clause *free of all average;*	

50 per cent. on *merchandise,* coasting voyages, by steamers, when the special premium on these ships is not charged.

Casualties to Shipping in the St. George's and Liverpool Channels in 1850.

THE facts relating to Marine Insurance, showing the actual risks which attach to any particular voyage or dangerous locality, are so few, that our readers may be glad of the opportunity afforded us, by the kindness of Mr. John Young, underwriter, Lloyd's, to examine, as brought together in one view, a summary of the accidents which have occurred, in the course of the year 1850, in the St. George's and Liverpool Channels. The inquiry does not extend over a sufficient length of time, nor is it complete enough, to allow of any very important deductions being drawn. But the number of accidents, and the number of vessels damaged or wrecked, and still more the great number of lives which have been lost, even in the few cases where the number could be ascertained, may lead to a desire to obtain a more complete collection of facts for a longer period. The danger to human life is one in which underwriters may not be so specially concerned as Assurance Companies; but perhaps attention would be more forcibly drawn to the subject, if the observations of a greater number of years were published. We showed in the last Number of this Magazine, the great loss of property occurring in the navigation of the Thames; and the table which we now give will exhibit an estimate, roughly made, of the same kind, in the passage of the Channels to Liverpool. The great defect of all registers of marine, as well as of other risks, at present, is the want of some uniform plan on which information may be furnished. The particulars in the former principally required are the exact dates, the locality in which an accident occurred, and, wherever it can be ascertained, the estimate of the damage caused. A very simple plan would be for all who are interested in giving the information, to be furnished with ruled forms, the required particulars to be inserted in blank spaces, from which tables of much interest and importance might probably be eventually obtained. The dangers of navigation, and the damages caused to shipping, either by collisions, by rocks, or by storms, being more accurately known and estimated, might lead to such improvements in the usual channels of navigation as experience would dictate, or to the establishment of other ports, the passage to and from which would be less costly to the commerce of the country, and less hazardous to human life.

Summary of Casualties in the St. George's and Liverpool Channels, comprising Loss of Life, Loss of Vessels and their Cargoes, Collisions, &c., during the Year 1850.

Reported in Month.	CASES OF COLLISIONS.			Total.	Grounded.	Totally wrecked or abandoned.	Both.	Total No. of vessels damaged.	Lives lost.	ROUGH ESTIMATE OF DAMAGE.	
	Sailing vessels with sailing vessels.	Steamers with sailing vessels.	Steamers with steamers.							In No. of vessels.	Amount.
1850											£
Jan.	2	4	1	7	9	2	11	25	18	14	55,400
Feb.	5	1	..	6	4	2	6	18	..	12	23,500
March	4	1	..	5	24	2	26	36	3	29	18,000
April	2	..	..	2	5	1	6	10	..	7	8,800
May	..	..	..	..	4 (1 being steamer.)	..	4	4	..	3	1,200
June	1 (Schooner went down.)	..	..	1	2	..	2	4	2	2	2000
July	2	.	..	2	1	..	1	5	..	5	1000
Aug.	..	2 (1 sailing vessel sunk.)	..	2	5	2	7	11	7 (and crew of wrecked vessel.)	6	7,400
Sept.	..	..	..	..	4	2	6	6	(All lives in a schooner lost.)	4	11,800
Oct.	3	2	..	5	11	9	20	30	25 (and all but one in a wrecked vessel.)	23	21,000
Nov.	3	..	..	3	8	5	13	19	1	11	25,300
Dec.	3 (1 run down.)	..	1	4	6	..	6	14	5	1	5000
	25	10	2	37	83	25	108	182	59 (and more.)	117	180,400

It will be noticed from the totals of the above table, that in the short space of twelve months, and in the short navigation alluded to, there were no less than 182 vessels injured, either by coming in contact with each other, or running aground, &c.: that out of 37 cases of collision, 25, or 67·6 per cent., were of sailing vessels in contact with sailing vessels; 10, or 27 per cent., of steamers in contact with sailing vessels; and 2, or 5·4 per cent., of steamers in contact with steamers: that out of 108 vessels which went aground, 25, or rather less than 23 per cent., were totally wrecked or abandoned; and that besides 59 lives known to be lost, all but one individual of the crews of three other vessels went down.

Marine Insurance in Antwerp.

In the Reports of Foreign Companies we have given some of the Accounts of the Marine Insurance Companies of Belgium to a more recent date; but the following General Summary of the business of ten Companies for an entire year, taken from Masius, Allgemeine Versicherungs Zeitung for 1848, may be useful for the comparison of average results.

General View of the Operations of the Marine Insurance Companies of Antwerp, for the Year 1847-48.

Name of Company.	Amount Assured.	Premiums.	Reassurance Premiums, &c.	Premiums carried over.	Losses and Valuation.	Commission.	Profit.	Loss.	Expenses of Management.
	£	£	£	£	£	£	£	£	£
Cinquième Compagnie	781,532	15,129	3,376	2,097	5,751	543	3,362	..	*801
L'Escaut	322,556	7,062	—	729	3,325	355	2,653	..	*1,131
Agriculture et Commerce	226,204	5,400	375	679	2,784	254	1,308	..	429
Anversoise	264,035	6,006	390	710	2,529	194	2,183	..	330
L'Océan	200,760	4,669	367	487	2,432	188	1,196	..	423
Le Rhin	287,403	5,611	1,132	463	3,961	196	..	141	405
L'Espérance	154,630	3,270	272	235	2,693	158	..	127	320
Le Comptoir Spécial	282,611	6,704	313	1,293	2,688	195	2,215	..	500
Comp. Securitas	52,309	1,767	25	872	275	162	438	..	*594
Cercle d'assureurs particuliers	228,695	5,774	692	..	2,494	279	2,000	..	72
	2,800,735	61,392	6,942	7,565	28,932	2,524	15,355 268 15,087	268	5,005

* These Companies include in these expenses the management both of the Sea and Fire business.

From the totals of these columns it may be deduced that the average *premiums* for the year were nearly 2·19 per cent. on the sum assured; that the *losses* were rather more than 1·03 per cent. on the sum assured, or 47·13 per cent. on the premiums received; that the profits were 24·575 per cent. on the premiums, and the average expenses of management about £500 for each Company annually, or 8·15 per cent. on the premiums.

NOTES AND QUERIES.

[Under this head we propose to give brief notices of whatever is remarkable as connected with the theory, practice, or history of Assurance here or abroad, and to afford an opportunity for inquiries in relation thereto.]

THE following mode of deducing the formula for an endowment assurance will perhaps be new to some of our readers.

The sum assured is to be paid at a given age, if that age be attained; or at death, should it happen previously. But this would exactly be the case with an assurance calculated from a table of mortality terminating at the age in question. So that we have only to treat the annuity obtained from such a table in the same way that the annuity for the whole term of life is used, in order to arrive at the usual results. Hence the annual premium for an endowment assurance will be $1 \div \frac{N_{x-1} - N_{x+n-1}}{D_x} - d$.

Or thus:—

The single premium for a temporary assurance is $\frac{1 + A^{t-1}}{1+\rho} - A^t$, (*see* Baily, vol. i., p. 149,) and for the endowment $\frac{a}{a}(1+\rho)^{-n}$.

But $\frac{1 + A^{t-1}}{1+\rho} - A^t + \frac{a}{a}(1+\rho)^{-n} = \frac{1 - \rho A^{t-1}}{1+\rho}$; the usual expression for the single premium, A^{t-1}, being substituted for A.

Or, reasoning as in Milne, (vol. i., p. 167,)

$$\frac{1}{1-v} : \frac{v}{1-v} - A^{t-1} :: 1 : v - (1-v)A^{t-1}.$$

The following ingenious method of approximating to the value of ρ, in the equation $A = \frac{(1+\rho)^n - 1}{\rho}$, we have received from Mr. Edward Ryley, the able actuary of the Australasian Assurance Company:—

The *amount* of an annuity being represented by A, the *rate of interest* by ρ, and the *number of years* by n, we have

$$A = \frac{(1+\rho)^n - 1}{\rho} \ldots . (a),$$

as the value of A in terms of ρ and n.

It is required to eliminate ρ from this equation.

[In Baily's "Interest and Annuities," p. 123, are collected the methods employed by Simpson, Halley, and the author himself. Mr. Baily's formula is very accurate, but practically useless on account of its complexity.]

From equation (a) we have

$$A\rho + 1 = (1 + \rho)^n,$$

and

$$\log.\ (A\rho + 1) = n \log.\ (1 + \rho) \ldots . (b).$$

Expanding each side of this equation, we have

$$2M \left\{ \frac{A\rho}{A\rho + 2} + \frac{1}{3}\left(\frac{A\rho}{A\rho + 2}\right)^3 + \frac{1}{5}\left(\frac{A\rho}{A\rho + 2}\right)^5 + \&c. \right\}$$

$$= 2nM \left\{ \frac{\rho}{\rho + 2} + \frac{1}{3}\left(\frac{\rho}{\rho + 2}\right)^3 + \frac{1}{5}\left(\frac{\rho}{\rho + 2}\right)^5 + \&c. \right\} \ldots\ldots (b),$$

where M is the modulus of the system of logarithms employed.

These series have the advantages of being generally convergent, and, the terms being always fractional, of proceeding by the uneven powers of the terms.

But the two sides are very unequally convergent: for $\frac{A\rho}{A\rho + 2}$, being always fractional, approaches without limit to unity as A increases; whilst $\frac{\rho}{\rho + 2}$ is always in practice so small a fraction, that the uneven powers of it, after the first, which enter into the series, may be neglected without sensible error.

Neglecting all the terms except the first, on both sides, we obtain

$$\rho = \frac{2(A - n)}{(n - 1)A} \ldots . (c).$$

This is a very near approximation when the rate of interest is low and n small.

Thus, at 3 per cent., for $n = 3$, $n = 5$, and $n = 10$, the answers are $\rho = \cdot 0294$, $\rho = \cdot 0291$, and $\rho = \cdot 0284$.

For $n = 50$, the answer is $\rho = \cdot 0227$.

The errors then are

. for $n = 3$; ·0006
$= 5$; ·0009
$= 10$; ·0016
$= 50$; ·0073, or nearly 1 per cent.

But this approximate value of ρ being thus obtained, we may by the use of the same method of development obtain a much nearer value.

Call the value of ρ thus obtained ρ', and put $\rho' + \rho'' = \rho$ in the equation (b); which thus becomes

$$\log.\ (A\overline{\rho' + \rho''} + 1) = n \log. (1 + \rho' + \rho''),$$

$$\text{or } \log.\ (A\overline{\rho' + 1} + A\rho'') = n \log. (1 + \rho') \left(1 + \frac{\rho''}{1 + \rho'}\right);$$

which developed becomes

$$\log. (A\rho' +) 1 + 2M \left\{ \frac{A\rho''}{2(A\rho' + 1) + A\rho''} + \&c.\ \&c.\right.$$

$$= n \log. (1 + \rho') + 2n\mathrm{M} \left\{ \frac{\rho''}{2(1 + \rho') + \rho''} + \&c. \&c. \right.$$

In this expression, it is evident that if ρ' be a moderately near approximation to ρ, the terms $\mathrm{A}\rho''$ and ρ'', which occur in the denominators on either side, are very small in comparison to $2(\mathrm{A}\rho' + 1)$ and $2(\rho' + 1)$, to which they are added. Omitting these terms, $\mathrm{A}\rho''$ and ρ'', from the denominators, and putting $\mathrm{A}\rho' + 1 = \mathrm{K}$ and $\rho' + 1 = \mathrm{R}$, we obtain

$$\rho'' = \frac{\mathrm{RK}\,(\log. \mathrm{K} - n \log. \mathrm{R})}{\mathrm{M}\,(n\mathrm{K} - \mathrm{AR})};$$

or, substituting, except in the factor $\log. \mathrm{K} - n\,.\,\log. \mathrm{R}$, the values of R and K, we obtain

$$\rho'' = \frac{\{1 + (\mathrm{A}\rho' + \mathrm{A} + 1)\rho'\}\ (\log. \mathrm{K} - n \log. \mathrm{R})}{\mathrm{M}\,\{n + (\overline{n - 1}\,.\,\rho' - 1)\,\mathrm{A}\}}.$$

If in this expression we omit the term multiplied by ρ'^2 from the numerator, we shall obtain finally

$$\rho'' = \frac{\{1 + (1 + \mathrm{A})\,\rho'\}\ (\log. \mathrm{K} - n\,.\,\log. \mathrm{R})}{\mathrm{M}\left(n + (\overline{n - 1}\,.\,\rho' - 1)\,\mathrm{A}\right)} \ldots .(d).$$

If we correct the values of ρ', previously found (p. 333), by this formula, we obtain

for $n = 3$; $\rho'' = \cdot 0009$
„ $n = 5$; $\rho'' = \cdot 0009$
„ $n = 10$; $\rho'' = \cdot 0016$
„ $n = 50$; $\rho'' = \cdot 0084$

Applying these corrections to the values of ρ', at p. 333, we have

for $n = 3$; $\rho = \cdot 0303$
„ $n = 5$; $\rho = \cdot 0300$
„ $n = 10$; $\rho = \cdot 0300$
„ $n = 50$; $\rho = \cdot 0311$

and the final errors are

for $n = 3$; ·0003
„ $n = 5$; ·0000
„ $n = 10$; ·0000
„ $n = 50$; ·0011

If we apply the same methods to $n = 10$, $\mathrm{A} = 13{\cdot}1808$, we shall find as the result of equation (c), $\rho' = \cdot 0536$, in which the error is ·0064. The correction by equation (d) gives $\rho'' = \cdot 0068$; so that $\rho = \rho' + \rho'' = \cdot 0604$, being a final error of ·0004.

NOTE.—The equation (d) is more readily calculated in the form

$$\rho'' = \frac{(\mathrm{A}\rho' + \rho' + 1)\ (\log. \mathrm{K} - n \log. \mathrm{R})}{\mathrm{M}\{(n - 1)\,\mathrm{A}\rho' - (\mathrm{A} - n)\}}.$$

Mr. Augustus De Morgan, Professor of Mathematics in University College, and Hon. Sec. of the Astronomical Society, has favoured us with the following note "On the equivalence of Compound Interest with Simple Interest paid when due."

At one time there was much discussion upon the value of an annuity at simple interest, and the apparent paradox that a perpetual annuity at simple interest is of infinite value. The reader may find this so-called difficulty discussed in the *Supplement* of the *Penny Cyclopædia*, article "Rebate:" it arises from the suppositions made in the rule of discount *at simple interest* being different from those on which the annuity is supposed to be paid. It seems now to be tolerably well agreed that £20 will pay a perpetual annuity of £1, at simple interest, merely because the interest is always paid away in satisfaction of the claim before any interest upon interest can be made. And yet there can be no doubt that if the buyer of the annuity divides his £20 into $v+v^2+v^3+\ldots.$, where $v=1\div1{\cdot}05$, and chooses to believe that v, v^2, &c. are paid at the end of the first, second, &c. years, he receives those sums with compound interest. Accordingly, it is admitted that a perpetual annuity has the same value whether money makes simple or compound interest. But I am not aware that it has ever been asserted that the value of a *terminable annuity* is the same thing whether simple or compound interest be supposed. Simple interest, paid when due, *is* compound interest, if it be granted that the actual holder of money may make interest. The fiction of the old rules lies in this, that the actual holder is to make no interest of any money which was ever received under the name of interest. Nevertheless, I have never met with any work in which the equivalence of simple interest, paid when due, and of compound interest, is actually shown.

To show it in the case of a terminable annuity, proceed as follows. A person lends £1 to be repaid by £a at the end of each of n following years. On the theory of compound interest, the loan of £1 is divided into av, av^2. av^3, &c., and these portions are repaid with compound interest at the end of one, two, three, &c. years. On the theory of simple interest, k standing for $\{(+r)^n-1\}\div r$, the loan of £1 is divided into the following portions:—

$$\frac{1}{k}, \quad \frac{1+r}{k}, \quad \frac{(1+r)^2}{k}, \ldots\ldots \frac{(1+r)^{n-1}}{k},$$

and at the end of each year, one of these portions is paid as instalment of principal, together with interest upon all which remained due at the end of the last year. This in every case, makes up £a, the payment made under the compound interest scheme.

To show this, let V_m represent the sum which remains due at the end of the mth year, where £a is made to pay simple interest and instalment. Then at the end of the $(m+1)$th year, rV_m of interest is due, and $a-rV_m$ is left to reduce the principal. Hence

$$V_{m+1}=V_m-(a-rV_m); \text{ or, } V_{m+1}=(1+r)\,V_m-a.$$

The solution of this equation of differences, upon the supposition that we begin with $V_0=1$, is

$$V^m = \frac{a}{r} - \left(\frac{a}{r} - 1\right)(1+r)^m;$$

and if we require that the principal shall be extinguished in n years, or $V_n = o$, we must have

$$a = \frac{(1+r)^n \cdot r}{(1+r)^n - 1}; \text{ or, } \frac{r}{1-v^n},$$

the same as in the compound interest scheme. Further, the instalment paid at the end of the *m*th year, $V_{m-1} - V_m$, will be found to be $(a-r)(1+r)^{m-1}$, as above asserted, for $(a-r)\,k = 1$.

Suppose the following question;—There is a debt of £*b*, to pay which there is a yearly fund of £*a*, which is first to pay interest, and then to go in reduction of principal; what debt remains at the end of m years? If we let the debt remain entire, at compound interest, it will in m years be $b(1+r)^m$: and if we make a sinking fund, also at compound interest, of the redeeming annuity, we shall in m years have $a\{(+r)^m - 1\} \div r$. If, then, simple interest paid when due, and compound interest, be of identical effect, the debt remaining at the end of m years will be

$$b(1+r)^m - a\,\frac{(1+r)^m - 1}{r};$$

or,

$$\frac{a}{r} - \left(\frac{a}{r} - b\right)(1+r)^m,$$

which is precisely what we should get from such a process as we used above, making $V_o = b$ instead of $V_o = 1$.

FOREIGN INTELLIGENCE.

Belgium.—*Antwerp.—Summary of Maritime Insurances effected by the "Cercle d'Assureurs Particuliers" from* 1841 *to* 1849 *inclusive.*

Year.	Sums Insured.	Premiums.	Returns.	Brokerage.	Losses and Averages.	Reinsurances.	Expenses.	Recovered on Reinsurances.	Distribution of Profits.
	£	£	£	£	£	£	£	£	£
1841	96,059	2,533	123	126	282	93	33	—	824
1842	146,808	3,346	101	173	1,713	135	59	9	1,280
1843	139,766	3,098	151	158	2,836	116	71	172	—
1844	170,094	3,178	95	175	1,626	169	49	24	1,066
1845	184,824	4,794	99	225	2,533	347	70	106	960
1846	174,123	4,727	131	204	3,414	603	68	475	622
1847	228,695	5,774	155	279	3,470	537	72	1,076	2,000
Jan. 1848	26,993	561	50	23	1,650	29	29	111	308
Dec. "	12,770	218	35	9	204	32	—	27	—
1849	125,200	2,966	60	144	469	119	80	—	1,656
	1,305,332	31,195	1,000	1,516	18,197	2,180	531	2,000	8,716

1,516	Brokerage, = 4·86 per cent. . .	on premiums.
18,197	Losses and averages, = 58·34 per cent. (or 1·394 per cent. on sums insured)	
2,180	Reinsurances, = 7· per cent. . .	
531	Expenses, = 1·31 per cent. . .	
23,424		
7,771		
2,000	Recovered on reinsurances, = 6·41 per cent.	
9,771		
1,055	Reserved for valuations.	
£8,716	Net profits, being an average of nearly 28 per cent. on the premiums received.	

The "Cercle d'Assureurs Particuliers" consists of 20 members, each of whom participates in an equal proportion in the insurances, without, however, in any case participating in the risks on one and the same vessel to a greater amount than £40, and without there being any responsibility amongst the members. The maximum of the "Cercle" is therefore limited to £800. on the value of a single risk.

Compagnies d'Assurances Maritimes souscrivant à Anvers.

	Compagnies. No. 1 à 13 Compagnies fondées à Anvers ; No. 14 à 22 Etablissements étrangers.	Capital de Garantie,	Versé.		Pouvant souscrire sur un risque.	Années de formation des Compagnies.	Observations.
		FRANCS.	p. c.	FRANCS.	FRANCS.		
1 1°	La Comp^{le} d'Anvers Securitas ; Agent général M. Van Donghen	6,349,200	20	1,269,840	63,500	1819	Cette C^{le} a un fonds de réserve considérable et qui s'élève au moins à Fr. 500,000.
2 1°	La Comp^{le} d'Assurances de l'Escaut; Directeur A. Diercxsens	4,232,800	25	1,058,200	84,600	1821	Cette C^{le} est aussi dans une situation très-prospère, mais ne conserve que le fonds de réserve d'une année; le dernier compte de gestion présenté le 1^{r} Juillet 1850, a réparti aux actionnaires environ 15 *o/o*, outre à peu près 5 *o/o* de réserve.
3 1°	La 5^{e} Comp^{le} d'Assurances ; Directeur J. F. Flemmich	4,000,000	20	800,000	40,000	1837	Le capital de réserve de cette C^{le} s'élevait au 31 Décembre dernier, à Fr. 181,980 et elle a fait cette année-là, un bénéfice net de 10 *o/o*.
	LES TROIS SUSDITES COMPAGNIES SOUSCRIVENT AUSSI LES RISQUES CONTRE INCENDIES.						
4 1°	La Comp^{le} Anversoise d'Assurances maritimes; Directeur Aug. Aulit	1,000,000	30	300,000	30,000	1849	Cette C^{le}, qui avait parcouru d'une manière prospère le terme fixé par ses statuts, a été renouvelée l'année dernière et a donné à son début une légère perte, due à de nombreuses pertes totales de navires, qui sont venus coup sur coup frapper nos assureurs.
5 1°	Le Comptoir Spécial, d'Assur^{s} marit^{s}; Directeur Const. Dele Haye	2,116,400	20	423,280	42,300	1842	Cette C^{le} a un capital dé réserve de Fr. 105,820 et a donné à ses actionnaires au 30 Juin 1850, un bénéfice de 11$\frac{1}{40}$ *o/o* pour la dernière année.
6 2°	La Comp^{le} d'Assurance Agriculture et Commerce; Direct^{r} Jules Josson	1,500,000	20	300,000	45,000	1844	Cette C^{le} a un fonds de réserve d'env. Fr. 50,000 et a donné au 30 Juin 1850 un bénéfice d'env. 7$\frac{1}{2}$ *o/o*.
7 1°	La Comp^{le} d'Assur^{s} l'Océan ; Directeur P. Diercxsens	1,000,000	30	300,000	30,000	1846	Capital de réserve env. Fr. 36,000; bénéfice de la dernière année de gestion, finissant au 30 Juin 1850, env. 9$\frac{1}{2}$ *o/o*.
8 2°	La Comp^{le} d'Assurances l'Espérance; Directeur Gamain	1,000,000	15	150,000	15,000	1846	Fonds de réserve env. Fr. 12,000; bénéfice de la dernière année de gestion, finissant au 30 Juin 1850, env. 15$\frac{1}{2}$ *o/o*
9 2°	La Comp^{le} d'Assurances l'Antverpia; Directeur J. De Bruyn..............	1,000,000	20	200,000	20,000	. .	Ces deux C^{les} étant à leur première année d'existence n'ont pas encore eu de comptes à rendre.
10 2°	La Comp^{le} d'Assurances l'Atlantique; Directeur J. Stappaerts	1,000,000	20	200,000	17,000	. .	

	COMPAGNIES. No. 1 à 13 Compagnies fondées à Anvers; No. 14 à 22 Établissements étrangers.	Capital de Garantie.	Versé.		Pouvant souscrire sur un risque.	Années de formation des Compagnies.	OBSERVATIONS.
		FRANCS.	p. c.	FRANCS.	FRANCS.		
11 1°	Van Gend et Loos, Assureurs partic^{s}	..	..	..	26,000	..	Les Établissements N° 11 à 22, étant ou des entreprises étrangères à la place, ou des Associations, qui ne sont pas anonymes et n'ont par conséquent pas de comptes à publier, il n'est pas possible de donner des renseignements exacts sur leur situation, qui est cependant très-prospère, tous ces Établissements travaillant concurremment avec les Compagnies N° 1 à 10, en suivant le même système et souscrivant les mêmes risques.
12 1°	J. F. Flemmich, agissant au nom et p^{r} p^{on} individuelle de divers	..	..	..	20,000	..	
13 2°	D. Grenier, au nom et p^{r} p^{on} de divers	..	..	..	50,000	..	
14 1°	La Comp^{ie} d'Assurances Générales de Paris; Agent Ch^{s} Loyaerts	5,000,000	20	1,000,000	50,000	..	
15 1°	La C^{ie} d'A^{e} M^{e} et fluviale du Brabant Septentrional; Ag^{t} P. Diercxsens	423,280	10	42,328	16,000	..	
16 1°	J. F. Flemmich, agissant p^{r} C^{te} de six Comp^{ies} d'Assur^{s} d'Amsterdam	..	..	..	20,000	..	
17 1°	La Comp^{ie} d'Assurances Agrippina, de Cologne; Agent Théod. C. Engels	7,500,000	20	1,500,000	30,000	..	
18 1°	La Compagnie du Bas-Rhin; Agent Eug. Cambier	3,750,000	10	375,000	30,000	..	
19 2°	La Comp^{ie} d'Ass^{s} La Garonne, de Bordeaux; Agent D. Grenier	1,200,000	20	240,000	24,000	..	Cette C^{ie} peut souscrire jusque Fr. 60,000.—
20 2°	La Comp^{ie} d'Assurances Générales de Dusseldorf	1,875,000	10	187,500	45,000	..	„ „ „ 4 o/o de s/ capital.
21 2°	La Société d'Ass^{s} Gén^{s} Néerlandaise de Tiel	1,100,000	20	220,000			„ „ „ 5 o/o „
22 2°	La Comp^{ie} d'Ass^{s} Gén^{s} Néerlandaise de Tiel Agent W^{m} Ronstorff, qui signe collectivement pour ces 3 Compagnies	2,425,000	20	485,000			„ „ „ 4 o/o „
					698,400		

N.B.—Les 13 Compagnies marquées 1° forment la première Réunion.
„ 9 „ „ 2° „ deuxieme „

1° RÉUNION.	2° RÉUNION.
Fr. 63,500.—	Fr. 45,000.—
„ 84,600.—	„ 15,000.—
„ 40,000.—	„ 20,000.—
„ 30,000.—	„ 17,000.—
„ 42,300.—	„ 50,000.—
„ 30,000.—	„ 24,000.—
„ 26,000.—	„ 45,000.—
„ 20,000.—	„
„ 50,000.—	„
„ 16,000.—	
„ 20,000.—	
„ 30,000.—	
„ 30,000.—	
Fr. 482,400.—	Fr. 216,000.—

ANVERS, 1er *Juin* 1851.

COMMUNIQUÉ PAR

FRANÇOIS STEENVELD,

Courtier d'Assurances.

FRANCE.—*Summary of the Report of "Le Phénix" Life Assurance Company to* 31 *Dec.* 1850, *read at the General Meeting,* 27 *May,* 1851.

The position of the Tontine Classes on 31st December, 1850, was as follows:—

Date.	Duration of the Class.	No. of Subscriptions.	Amount of Subscriptions.	Investments made.	Annual Income in 3 per cents.	Cost of do.
			£	£	£	£
1846	8 years	273	10,115	6,831	313	6,714
"	12 "	540	29,930	11,842	547	11,587
"	16 "	457	27,460	7,028	324	6,836
"	20 "	487	44,035	9,161	428	8,864
1850	20 "	42	3,560	316	15	282
		1799	115,100	35,178	1,627	34,283

The position of each of these classes is highly favourable. The average of the subscriptions is £64, and the average amount paid up is £19 for each subscription.

The results of the subscriptions which have fallen in are as follow:—

Duration of Class.	Subscriptions fallen in.		Amount paid upon ditto.
	No.	Sums.	
		£	£
8 years	49	1,576	425
12 "	121	7,004	1,200
16 "	129	6,585	788
20 "	119	7,739	727
	418	22,904	3,140

The new Class for 20 years, commenced 1st January, 1850, obtained within the year 42 subscriptions for £3,560. The other classes, still open, have increased in a still greater proportion. The expenses allowed by the regulations of the Company for this branch of the business are scarcely adequate to the costs of its full development; yet the Company has spared no labour or attention to increase the number and amount of the subscriptions. The position of the country, and the unjust attacks to which the assurance interests have been exposed, may have increased the difficulties, and made success more costly; but there is every reason to hope that the improvement in the political and financial condition of affairs will, in the course of the ensuing year, greatly assist the operations of the Company.

Report of the Fire Insurance Company "Le Phénix" for the year 1850.

		£
The risks insured by the Company on the 30th June, 1850, were .		142,563,044
In the following half-year 20,185 policies were issued, insuring .		16,990,308
Reinsurances from other Companies		2,565,616
		£162,118,968
From which deducting cancelled insurances	£14,044,706	
And reinsurances with other Companies .	3,303,909	
		17,348,615
Remaining in force, 31 Dec. 1850 . . .		£144,770,353

Profit and Loss Account.

	£		£
Balance, 30th December, 1849	51,794	Discounts, &c. on bills	228
Premiums reserved for insurances in force on 30th June last	35,936	Premiums and commissions on re-insurances	7,846
Reserve capital	71,000	Expenses of various kinds at Paris	6,038
Duty on policies	783	Allowances to agents	14,143
Premiums for new insurances	19,222	Losses paid in 1092 fires	34,268
Payments of bills for former insurances	7,970	Other payments to the assured	97
Interest and other payments received	7,180	Various expenses authorised in the agencies	3,756
		Premiums reserved for risks in force 31st December, 1850	35,934
		Reserve capital at the same date	71,000
		Balance	20,575
	£193,885		£193,885

The balance has been disposed of as follows:—

	£
1. For the stamps of policies in 1850	668
2. In augmentation of the premiums reserved for insurances in force	707
3. Added to the Company's reserve capital	4,800
4. Dividend of £3. 12*s*. per share on 4,000 shares	14,400
	£20,575

	£
The capital of the Company is	160,000
Adding the reserve premiums increased as above	36,643
„ the reserve capital, do.	75,800
	£272,443
To which may be added—	
The total premiums receivable in 1851	129,617
And the total premiums received for 1852 and following years	411,087
Totals of premiums receivable, of reserves, and Company's capital	£813,147

The losses which have fallen upon the Company, from its commencement to the 31st December last, were as follow:—

	No.	Sums. £
Total losses to 30th June, 1850	36,607	1,915,676
„ in the half-year to 31st Dec. 1850	1,092	34,268
Total losses to 31st Dec. 1850	37,699	£1,949,944

Comparison of some of the principal Mutual Tontine Associations.

The 18 Companies authorized by the Government from their commencement up to the end of 1850 have obtained altogether

	£
409,493 policies, amounting to	16,593,550
Of which sum there has been invested	5,759,218
And has served to purchase in the Government Funds an annual income of	271,902

It will thus appear that the average amount of each policy is about £40·5; that 34·7 per cent. of the amounts has been paid up and invested, and that the average rate of interest produced by all the investments in the French Government Funds, extending from 1841 to the present time, is 4·72 per cent. The proportion in which some of the principal Companies have participated in the total of the policies, the amounts of subscription, and the investments, are as follows:—

	No. of Policies.	Amount of Subscriptions.	Investments.
La Caisse Paternelle . .	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{4}$
La Nationale . . .	$\frac{1}{32}$	$\frac{1}{9}$	$\frac{1}{5}$
La Prévoyance . . .	$\frac{1}{6}$	$\frac{1}{7}$	$\frac{1}{8}$
L'Équitable . . .	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{9}$
La Caisse des Écoles . .	$\frac{1}{8}$	$\frac{1}{10}$	$\frac{1}{8}$
L'Économie . . .	$\frac{1}{12}$	$\frac{1}{16}$	$\frac{1}{24}$
La Minerve . . .	$\frac{1}{9}$	$\frac{1}{13}$	$\frac{1}{28}$

The subscriptions for the year 1850 only have amounted to

	£
14,142 policies for	636,106
And the investments have been . . .	773,870

And out of these numbers and sums the above Companies have participated in the proportion of—

	No. of Policies.	Amount of Subscriptions.	Investments.
La Caisse Paternelle . .	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$
La Nationale . . .	$\frac{1}{55}$	$\frac{1}{15}$	$\frac{1}{7}$
La Prévoyance . . .	$\frac{1}{7}$	$\frac{1}{8}$	$\frac{1}{9}$
L'Équitable . . .	$\frac{1}{8}$	$\frac{1}{7}$	$\frac{1}{11}$
La Caisse des Écoles . .	$\frac{1}{24}$	$\frac{1}{46}$	$\frac{1}{10}$
L'Économie . . .	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{25}$
La Minerve . . .	$\frac{1}{5}$	.. $\frac{1}{14}$	$\frac{1}{27}$

(*Report of La Caisse Paternelle*).

HOLLAND.—*Conditions of the Loan of* 2,500,000 *guilders* (£208,333) *for encouraging Free Cultivation in the Dutch East Indies, under the Management and Guaranty of the East Indian Society of Administration and Annuities, established at Amsterdam in* 1842.

Art. 1. The capital of this loan is fixed at the maximum amount of *two and a half millions of guilders* (£208,333), in Dutch East Indian currency, (with liberty to increase the sum hereafter,) divided into shares, bearing interest and redeemable in the manner laid down in Art. 2, 5, and 6, under the management of the Society above named, and intended for the encouragement of free cultivation in the Dutch East Indies.

Art. 2. This loan is contracted at the yearly interest of 6 *per cent.*, payable by the above-mentioned *Society of Administration and Annuities*, during the term of its existence, as well as in the event of its prolongation, as provided for in Art. 2 of its Statutes.

Art. 3. Of the said sum of 2,500,000 guilders (£208,333), an amount of 1,000,000 guilders (£83,333) is reserved for subscribers in Holland; and should the entire sum so reserved not be taken within the period allowed for participating, the deficiency may be made up in the Dutch East Indies, where the subscription list shall be kept open until the full sum of 2,500,000 guilders (£208,333) shall be completed. Operations are to commence as soon as an amount of 1,000,000 guilders (£83,333) shall have been subscribed: meanwhile the transfer of contracts of consignments, concluded for long periods with the aforesaid Society, may be effected to the extent of the capital provisionally subscribed.

Art. 4. The shares are to be for *one thousand guilders* (£83$\frac{1}{3}$) each, in Dutch East Indian currency, to be paid up in the colony, in silver money, or the current value thereof, to the full amount of *one thousand Indian guilders*, without reference to the exchange at which it may be drawn for.

Art. 5. These shares shall consist in certificates of payment, bearing number from 1 to 2,500 inclusively, all of them signed by one of the commissaries duly appointed, and both the managers of the Society at Batavia, and countersigned by one of the delegates hereafter mentioned; each share being provided with 27 interest warrants, signed by one of the aforesaid managers;—each coupon (or warrant) being for 60 guilders (£5) East Indian currency; and payable likewise with 50 guilders (£4⅙) Dutch currency, at the office of the said Society in Amsterdam: the first coupon being for a sum equivalent to the number of months elapsed since the 1st January.

Art. 6. On the 1st May, 1846, (at latest,) and so on every successive year, the following number of shares may be drawn for repayment (by lot), in the presence of the after-mentioned delegates, by the administration of the Society at Batavia; viz.—

1st year	31	10th year	46	19th year	71	27th year	105
2nd	32	11th	48	20th	74	28th	110
3rd	33	12th	50	21st	78	29th	115
4th	34	13th	53	22nd	82	30th	120
5th	36	14th	56	23rd	86	31st	125
6th	38	15th	59	24th	90	32nd	131
7th	40	16th	62	25th	95	33rd	140
8th	42	17th	65	26th	100	34th	141
9th	44	18th	68				

The payment for the shares so drawn by lot, for redemption, shall take place on the 1st January, at the option of the holder, either at the office of the Society in Batavia, in Dutch East Indian currency, or at their office in Amsterdam, at the current rate of exchange.

The East Indian Society of Administration and Annuities reserves to itself the faculty of increasing or reducing the amount of the above-mentioned annual redemption, in case circumstances should prove the use or necessity of such modification. The holders of shares so made payable must affix their signatures to the same, in proof of their being redeemed and cancelled; and the payments so made shall be booked as reduction of the capital fund. All the bonds or contracts for moneys advanced from the said capital, and all instalments paid up against such moneys, shall remain deposited, until the final repayment thereof, and for an amount equivalent to the part remaining unredeemed, as security to the shareholders for the payment of the moneys advanced by them, and of the interest accruing thereon up to the period of repayment.

Art. 7. The administration of the said capital fund is to be intrusted to the East Indian Society of Administration and Annuities at Amsterdam, and in their name and behalf to the administrators of said Society at Batavia. And *three* delegates shall be appointed, on behalf of the shareholders, and for the purposes hereafter specified, *one* residing in Amsterdam, and *two* at Batavia; which delegates are to be chosen among the shareholders. The first appointments are to emanate from the head administration; but on the retirement of one or both the delegates in Batavia, their places are to be filled by appointments made by the administration there. In case one of these delegates should have disposed of all his shares, or in case a vacancy should ensue by decease, retirement, or discharge, the remaining delegate shall in that event present, within a *fortnight* at latest, a list of three names to the administration at Batavia,—from which list an appointment is to be made by absolute majority of votes; and in case of a vacancy occurring in Holland, the head administration shall make a new appointment, having previously prepared a list of *three* names chosen from among the holders of the greatest number of shares.

The first appointment, as also those to be successively made, is to take place by an authentic act, in which the parties so appointed are bound to declare that they accept the appointment of delegate.

The parties named in the first instance as delegates are—

Mr. A. T. Bik ...... } at Batavia; and
„ E. W. Cramerns.. }
Mr. J. Ter Menlen, jun. ....at Amsterdam.

The remuneration to be awarded to the said delegates shall be fixed by the managers of the Society at Batavia, subject to the approval of the head administration in Holland.

In default of such appointment, the managers at Batavia shall insist on its taking place, and, if deemed needful, provide in the same.

These delegates shall be entitled to demand all such explanations as they may think necessary, and to require insight into all books and papers connected with this concern.

Art. 8. The capital fund aforesaid shall be employed by the managers of said Society at Batavia in making such advances to the owners of fabrics (mills, &c.), the holders or tenants of lands (already under cultivation), as may be required to insure their success and promote the increase thereof. It shall also be allowable for certain parties to receive advances to enable them to plant and cultivate new lands; on condition, however, that the new lands so brought under cultivation shall produce quick returns. All such advances being subject to such stipulations as to the amount, the terms of repayment, the rate of interest, and the nature of the requisite security, as shall be found advisable and conducive to the interests of the concern; and, moreover, on the express condition that the entire amount of produce at the disposal of such owners or holders must be consigned to the managers of the Society in the colony, with a view to affording a more permanent security for the payment of capital and interest, — to which object the net proceeds of such produce, as far as it may suffice, is to be expressly applied.

The aforesaid advances, and the securities to be required, shall be arranged and settled in conjunction with the delegates; who shall also be entitled to propose money advances upon the aforesaid terms, whenever they are unanimously agreed as to the utility of such advances, and the moneys on hand shall allow of their proposals being entertained.

The entire amount of the earnings for agency or commission on the contracts of consignments in the East Indies devolves in behalf of the aforesaid Society.

Art. 9. All sums received by the managers of the Society in the colony, for successive instalments on the subscriptions in the Indies or in Holland, as well as all other moneys that the managers and delegates may not deem immediately applicable to the purposes aforesaid, are to be invested by them in such manner as shall appear most advantageous to the concern.

The securities proceeding from the said investment of moneys, as well as all contracts, mortgage-deeds, indentures, and other engagements, together with all other documents of value or importance, are to be deposited in the fire-safe box, at the office of the Society in Batavia; there to be kept under two different locks, the keys of which shall be intrusted *one* to a member of the administration of the Society, and the *other* to one of the delegates, respectively appointed as keepers of the said keys.

Art. 10. The aforesaid capital fund shall be placed with the Society at Batavia, under the head of "*Fund for the Encouragement of Free Cultivation in the Dutch East Indies;*" whereof a separate account shall be opened in the books of the Society, which account shall be accurately kept up to date, and must comprise all transactions relating to this concern.

These books are to be closed annually before the middle of April at latest, when a balance shall be struck; and on the books and balance being approved of by the delegates, (who are entitled to require corrections when requisite,) they shall affix their signatures to the same, in proof of such approbation.

A duplicate of the annual accounts and balance-sheet, accompanied by the remarks of the delegates and the requisite vouchers, shall be transmitted every year to the head directors of the Society, by the same conveyances which bring the annual balances and reports, with other documents, to the administration of the Society in Holland.

Art. 11. All remittances, whether in produce or bills of exchange, are to be directed to the office of the Society at Amsterdam, where the same are to be realized, and the repartitions to be made to the parties interested. The chief administration will, when it may be required, pass orders upon the managers at Batavia; which latter have the control and appointment of all the requisite clerks or officers, and also the stipulation of their emoluments and salaries, subject to the approval of the head administrators; and in every respect connected with this loan, they stand in the same relation towards the chief administration as they do to the aforesaid Society itself.

At the Society's office in Amsterdam, a separate account shall also be opened in its books for all matters relating to this loan, which account shall be regularly posted up to date.

Art. 12. The head management of this Society represents the joint shareholders in the loan, in all their rights and titles connected therewith; and as such is competent to act in law, both as demandant and respondent, through every stage to the final resort; and has also authority to settle, adjust, and compromise matters in dispute. The managers at Batavia, as being authorized by the chief administrators, shall be at liberty to exercise the same authority in all cases wherein it may be required in the colony.

Art. 13. Each shareholder, by the act of signing the subscription list for this loan, elects once for all, and in respect to each share, his domicile at the office of the Society in Batavia, inasmuch as it may be necessary for the colony; and inasmuch as it may be requisite in the mother-country, at the Society's office in Amsterdam.

Art. 14. Whenever disputes may arise between the administration, the delegates, and the shareholders generally, or any one herein concerned, and if such disputes cannot be brought to an amicable termination, they shall be referred to arbitrators appointed according to law; whose decision shall be considered final, as a judgment in the highest resort, to which parties shall be bound to submit.

GERMANY.—*Statement of the Progress and Position of some of the principal Life Assurance Companies of Germany at the close of the Year* 1849 *or* 1850.

Established.	Name of Company.	Year.	Assurances existing at the beginning of the Year.		New Assurances during the Year.		Assurances existing at the end of the Year.		Premiums and Interest received in the Year.	Claims paid.		Expenses of Management.		Funds.		Surplus.	Capital.	
			Persons.	Sums Assured.	Persons.	Sums Assured.	Persons.	Sums Assured.		No. of Persons.	Sums.	Absolute.	Per Cent. of Receipts.	In General.	Reserve for value of Policies.		Nominal.	Paid up.
				£		£		£	£		£	£		£	£	£	£	£
1829	Gotha Life Assurᵉ Compʸ	1850	15,471	3,517,014	1,138	265,786	16,082	3,643,471	162,748	325	79,943	6,778	4·16	859,565	704,345	134,877	Mutual	Mutual
1831	Leipsic Life ”	1850	4,413	744,300	209	29,814	4,424	740,500	33,126	97	16,500	1,863	5·62	160,125	143,327	1,184	Mutual	Mutual
1836	Berlin Life ”	1850	6,619	1,110,157	451	71,643	6,796	1,136,100	55,976	149	29,071	2,790	..	203,049	161,914	..	142,857	28,571
”	Munich Life ”	1850	1,111	125,208	231	20,257	1,256	135,500	5,981	15	1,167	..	..	22,111	..	..		
1845	Frankfort Life ”	1850	..	..	169	34,566	570	108,839	5,183	7	1,270	979	18·8	..	..	..	The Capital of the "Hypotheken Bank." 244,898	24,490
1846	Hammonia Life ” (at Hamburg)	1849	..	64,257	..	21,479	830	71,986	2,574	10	3,107	953	37·	2,987	..	..	Mutual	Mutual
1847	Janus Life ” (do.)	1850	1,181	164,002	983	126,864	1,978	262,351	9,270	24	4,614	2,024	21·9	6,228	..	..	71,429	7,143

The preceding Statement is an extract from a table with which we have been favoured by Herr Rath G. Hopf, of Gotha, in continuation of one in a similar form given in our last Number, omitting only such parts of it as we have already published. On comparison with the former, it will be found to present a very satisfactory rate of progress in the business of Life Assurance in Germany, as represented by these offices. We shall probably be able, in our next, to give the reports of some of the other Companies. In the last account, the particulars of the Frankfort Life Assurance Company were given for the year 1848, and in the above for 1850. Some of the items, also, are wanting in the former summary; but, making allowance for these defects, the following results will be observed on comparison. The total sums assured at the end of the year in the 7 Companies had increased from £5,800,140 to £6,098,747; being an increase of rather more than 5 per cent. The premiums and interest (omitting the Munich Company in both years) have increased from £261,201 to £268,877; an increase of 2·9 per cent. The claims (omitting the Hammónia Company in the latter year, as this item does not appear in the former) have diminished from £136,984 to £132,565; being a diminution of 8·28 per cent. The capital in hand of 6 of the Companies had increased from £1,177,748 to £1,254,065; being an augmentation of nearly 6·5 per cent.

GERMANY.—*Gotha.*—*Fire Insurance Bank for Germany.* (*Feuerversicherungsbank für Deutschland.*) The Report for the year 1850 shows a total receipt of £265,987, being £7,280 more than in the preceding year.

The total of the actual payments amounts to £50,953, being £18,498 less than in 1849. This sum includes £40,302 for losses for the past year already settled. The charges of the central administration of the bank to the amount of £5,150, on account of the interest received on the investment of the premium money, amount only to 3 per cent. on the gross premiums obtained in the year.

In consequence of the number and amount of the *losses* in the past year being extremely small, of which a specification will be furnished to each of the agents of the bank for the inspection of the shareholders, the total payments, inclusive of the reserve, made for assurances in forçe on the 1st January, 1851, amount only to £47,573. The net surplus amounts to £119,842, which allows of a return of 70 per cent. on all the premiums falling due between 1st July, 1849, and 1st July, 1850, and the sum of which according to the exact computation, including those received from agents, is £171,202.

The insurances in force in the year 1850 amounted to £48,659,710, and the sum of the future liabilities for unusual losses was £973,220. The sum of the insurances was about £427,704 less than in the former year. This result, and at the same time the higher proportion of premiums received, is owing to the experience of the bank, which has led to the different classes of insurances being limited according to their degree of risk, and the premiums in some respects raised accordingly.

The small amount of dividends payable since the year 1844 are now forfeited, in accordance with the regulations of the Company. Those shareholders who neglect in the course of the present year to claim payment of the outstanding dividends of 1845 still due to them, will at the close of the year be subject to a similar loss.

The former organ of the transactions of the bank, the (*Reichs-*) *Anzeiger der Deutschen*, ceased to appear last year; and the authorized intelligence of the transactions of the bank will in future be made known in the *Preussichen Staatsanzeiger*, at Berlin, as well as in the *Leipzeger Zeitung*, and the *Frankfurter Oberpostamtszeitung*.

Accounts of the Bank.

Receipts.

	£
1. Premiums brought forward according to the balance-sheet for 1849, adding a small payment from agency, and deducting cancelled insurances	77,402
2. Losses and expenses, provided for by the reserve from last year.	21,363
3. Total premium receipts in 1850, after deducting agents' expenses	162,922
4. Interest received	5,641
5. Profit on agio	19
6. Dividends for 1844 cancelled	69
Total receipts in 1850	£267,4

	£	£
Total receipts in 1850, brought forward . . .		267,416
Payments.		
1. For losses, settlements, and costs of valuation		
a. Claims standing over from 1849 . . .	4,157	
Provision for dividends due in 1849 . .	1,344	
b. Claims for the year 1850	40,302	
2. For various expenses	5,150	
	£50,953	
Reserve.		
1. For losses, expenses, still unsettled, of 1850 and former years, and provision for dividends . . .	17,950	
2. For covering the risks standing over for future years .	78,671	
		147,574
Net surplus		£119,842

Which affords to the total proportion of premiums sharing in the profits of the year a dividend of 70 per cent.

	£
The total amount of insurances in force in 1850 was . . .	48,659,710
Sum of the future liabilities included	973,220

£	
78,671	Premium reserve for the years 1851 to 1857.
17,950	Reserve for losses, expenses, &c. of the year 1850, still unsettled.
119,842	Surplus for the year 1850.
216,463	
2,843	For dividends due by former accounts, but unpaid.
£219,306	Present capital in hand, invested as follows:—

£	
155,470	Invested on good security, bearing interest.
37,841	In the hands of bankers and agents.
23,049	Cash and current bills.
2,770	Company's house.
176	" furniture, &c.
£219,306	Total capital.
£714	Security from the managers.
£2,857	" from the cashiers.

BAVARIA.—On the 8th March an extraordinary General Meeting of the shareholders of the Cattle Insurance Company of the Pfalz was held at Neustadt. A very excellent report was presented by the manager on the progress which the Company had made, and which presented the strongest grounds for congratulating the members on their success. The Company consists of 3,072 shareholders, with a capital of £60,537. The number of horses insured amounts to 2,285; cattle, 7,042; sheep and goats, 383; and swine, 245. The losses which had been indemnified had been 58 horses for £330; 102 cattle for £292; 3 goats for £1. 5*s.*; and 2 swine for £2. 13*s.* 6*d.* (Masius.) Assuming that the value of all the animals insured was in the same proportion as those on which losses were paid, the following will show the rate of actual risks incurred:—

	No.	Lost.	Value.	Losses.	Per cent.	Average value of each.
			£	£		£
Horses	2,285	58	13,000	330	2·54	5·7
Cattle..........	7,042	102	20,160	292	1·45	2·86
Sheep and Goats .	383	3	160	1·25	·78	·42
Swine..........	245	2	328	2·675	·82	1·33
	9,955	165	33,648	625·925	1·86	3·79

The "Stockholm City Mutual Insurance Society for Goods and Furniture" (*Stockholms Stade Brandstods Bolag till försäkring af lösegendom*) was established in 1844, and commenced its operations on the 1st October of that year. The insurances granted were—

	Banco Rdr.	Amount insured. £	Damages paid. £
In the first year, ending 30th Sept. 1845 .	(10,905,400)	900,450	122
Second " " 1846		1,068,958	69
Third " " 1847		1,420,383	740
Fourth " " 1848		1,647,358	798
Fifth " " 1849		2,026,592	726
Sixth " " 1850		2,151,733	6,048
And on the 31st December, 1850		2,228,333	
At present, 1st July, 1851		2,301,100	
Whereof on goods about		1,166,666	
And on furniture		1,083,333	

The greatest part of the last sum paid in losses was owing to the burning of a sugar refinery.

As the regulations prescribe that $\frac{1}{3}$ of the premium shall be reserved until the sum of Banco Rdrs. 100,000 (£8,333) is collected, and the annual premiums being very low—$\frac{1}{12}$, $\frac{1}{8}$, $\frac{1}{6}$, $\frac{1}{4}$ per cent., according to the danger of the localities and the solidity of the houses—the funds for paying the last year's damages were not sufficient, so that about £2,750 had to be raised from the members in proportion to their interest in the £2,166,666 insured, making a charge of $\frac{1}{8}$ per cent. The unexpected success during the earlier years had occasioned many to forget the right of calling for an extra payment in case of need, and consequently the call was not well met, small as it was. This year we shall therefore experience a considerable decline in the amount insured, and it is calculated that about £250,000 will be withdrawn; yet, as the present year has been a very favourable one, it is to be hoped that the confidence will return.

At the last meeting of the deputies, it was resolved that no goods or furniture stored in houses adapted to sugar refinery, oil manufacture, cotton spinning, or theatres, shall be insured for the future, but those already insured are not to be excluded. This resolution may be very good, but it is probable that it would have been better to restrict the amount of insurances on one house; as the case now stands, the directors cannot decline an insurance, be the amount ever so high, if it can only be proved that the property really exists, and is worth as much as it is valued at. According to the belief of others, we have many greater risks than those in sugar refineries; and the real danger of the latter depends upon the large amounts for which they are insured.

The income during the year ending 30th September, 1850, was—

	£
Premiums for new and for renewed insurances	2,604
Interests	192
And extra contributions, as above	2,770
	5,566
Capital on the 1st October, 1849	5,781
	£11,347

The payments in the same time:—

	£	
For losses by fire	6,048	
Fees to the directors	208	
Wages to the officers	211	
Office hire, printing, paper, and other expenses	72	
		6,539
		£4,808

Thus the funds of the society on the 1st October, 1850, were £4,808, whereof £4,294 belonged to the above-mentioned fund, which ought to accumulate till it reaches Rdrs. 100,000 (£8,333).

The expenses are somewhat high in proportion to the income; but when the reserved fund has been completed, the interest thereon will meet the greater part of the expenses. When premiums have been paid continuously for five years, they are reduced for the following years to half the amount—to $\frac{1}{24}$, $\frac{1}{16}$, $\frac{1}{12}$, $\frac{1}{8}$ per cent.; so that if we are not visited by greater losses, which may require fresh contributions, the premiums may be considered very low.

The number of insurances on the 30th September, 1850, was only 3933; but as this figure is very small comparatively to the population of Stockholm, it is reasonable to hope that the said diminution of the premiums will be made up by new insurances. The greatest part of the insured belong to the middling classes; the poor who subscribe are comparatively few, and the rich still fewer, and most of the goods are insured by shopkeepers.

Large fires are rare in Stockholm; probably owing to the mode of building, most of the houses being erected of stone, with stone stairs, and a sort of stone roofs called "brandbotten," which are very effective in preventing the fires from spreading to the adjoining houses: otherwise, our arrangements for extinguishing fires are not in a good state. The greatest dangers are in winter, when the water freezes in the engines; and as Stockholm is very extensive, fires in the remoter parts of the suburbs may be very destructive before the engines reach the spot.

There is a Mutual Insurance Society for the other towns of Sweden, but quite distinct from ours, which is confined exclusively to Stockholm. The risks elsewhere are much greater, most of our small towns being closely built of wood; but, on the other hand, the engines are much better served in some of them, especially in Norrlôping and Gothenburg.

MISCELLANEA.

The Productiveness of Marriages in England, 1696.—Gregory King observes, after giving the actual numbers of the population as computed, and the annual marriages and births in England in his time, "Whence we may observe that in 1000 coexisting persons,

There are 71 or 72 marriages in the country, producing 34·3 children.
78 marriages in towns, producing . . . 35·2 children.
94 marriages in London, producing . . . 37·6 children.

Whereby it follows—

1. That though each marriage in London produceth fewer people than in the country, yet London in general, having a greater proportion of breeders, is more prolific than the other great towns; and the great towns are more prolific than the country.

2. That if the people of London of all ages were as long-lived as those in the country, London would increase in people much faster, *pro ratâ*, than in the country.

3. That the reason why each marriage in London produces fewer children than the country marriages, seems to be—

1. From the more frequent fornications and adulteries.
2. From a greater luxury and intemperance.
3. From a greater intenseness to business.
4. From the unhealthiness of the coal-smoke.
5. From a greater inequality in age between the husbands and wives.

And that it may appear what the effect is of the inequality of ages in married couples, I have collected the following observations from a certain great town,* in the middle of the kingdom, consisting of near 3000 souls:—

1. That there is no child of any parents now living in the said town, where the wife is 17 years older than the husband, or the husband 19 years older than the wife.

2. That the whole number of children being 1060, the number of those where the mother was older than the father is 228, and where the husband was older than the wife, 832.

3. That one moiety of the whole number of children in the said town is the product of such parents where the husband is four or more years older than the wife.

4. That the greater number of children, with respect to any one number of years of difference in age between the husband and wife, is where the husband is two years older than the wife, the product whereof is 147, or a seventh part of the whole.

5. That an equality in age in the husband and wife is not so prolific as an inequality, provided that inequality exceed not a superiority of four years in the wife, or ten years in the husband; for the equality of years produced but 23 children, whereas one year's inequality in the age of the parents, either way, produced above 60.

6. That of the said 1060 children in the whole town, near three-quarters of them are the product of coalition from two years' superiority of age in the wife inclusive, to six years superiority of age in the husband inclusive.

7. That the highest powers in men and women for procreation is, in that town, at 31 years of age in the husband, and 28 in the wife; the produce of the former being 86 children, and of the latter, 83.

8. That one moiety of the said 1060 children are the product of fathers from 28 to 35 years of age inclusive, and of mothers from 25 to 32.

Whence it follows that a just equality, or too great an inequality of age in marriages, are prejudicial to the increase of mankind; and that the early or late marriages, in men and women, do tend little to the propagation of the human race.

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* Lichfield.

Lastly. From a consideration of the male and female children in the said town, and the ages of their parents at the time when such children were respectively conceived, a scheme may be established of the powers of generation, and the inclination of the several coalitions towards producing the one or the other sex, according to the superiority of power in either sex at the time of such respective coalitions."—(Natural and Political Observations and Conclusions upon the State and Condition of England, 1696. By Gregory King, Esq., Lancaster Herald.)

Vital Statistics of Iceland.—Deaths by Drowning.—I believe that there is no country in Europe where the number of those who perish every year by drowning is so high as in Iceland. This results from fishing being the main occupation of the people. As the greater part of those who perish by drowning in Iceland are males, between 15 and 60 years of age, I have considered that circumstance in constructing the following table, in which I have made the comparison between Denmark, Iceland, and the Färoe Islands:—

	Iceland.	Färoe Islands.	Denmark.
Total number drowned from 1835–44	530·	41·	2503·
Average yearly number drowned	53·	4·	250·
Number of inhabitants on an average of the census 1835, 1840, and 1841	57229·	7314·	1284817·
Drowned out of 100,000 living individuals	92·6	56·1	19·5
Drowned out of 100,000 males living between 15 and 60 years	351·6	196·9	67·3

It will hence be seen that the proportion of the drowned is more than five times as large in Iceland as in Denmark. If we compare the number of drowned in Iceland with the total number of deaths, it will be found that the proportion is 25·4 per cent. out of the total yearly number of males dying between 15 and 60 years of age.

Iceland is divided into 17 different districts. I have continued the computation for all those districts, and the number thus found indicates, in the most correct manner, where the best fishing places are to be found, and their yearly profit. I am inclined to believe that the rates which the fishing places are obliged to pay yearly to the Government, according to the greater or less profit of the fishery, are not paid with such an accuracy as the rate which the sea yearly enforces. I have also compared the proportion of other violent deaths (excepting suicides) to the population in Iceland, Färoe Islands, and Denmark, and found it to be, out of 100,000 living individuals, 22·9, 32·8, and 13·5 respectively. Here the proportion is highest in the Färoe Islands. The reason for this is that, next to the fishery, bird-catching is here the first employment of the people; but this occupation is very dangerous, as the birds build their nests on the high craggy rocks, of which these small islands consist.—(P. A. Schleisner, M.D., Statistical Journal, March 1851.)

Fertility of the Women of Iceland.—Almost all the foreigners who have travelled in Iceland, have mentioned the extraordinary fecundity of the nation as something remarkable. It is noticed, that marriages with 20 children and upwards occur frequently. But from such single facts, a general rule for the fertility of the nation cannot be deduced. I have tried to find it out. The fertility of a nation is generally indicated by the proportion of the children born to the whole population. Dr. Kayser, Professor of Statistics at the University of Copenhagen, has made a correction in that test. Instead of fixing the births in proportion to the whole population, he fixes them in proportion to the whole number of women at the fertile age, which, for the northern countries, is between 20 and 50 years.

I shall make the comparision between the results obtained by Dr. Kayser for Denmark, and mine for Iceland. Kayser's computation is founded on the series of years partly from 1830–44, and partly from 1827–44; mine is founded on the 10 years 1838–47.

	Average yearly number of births.	Average number of married women between 20 and 50 years.	Proportion of births to 100 women between 20 and 50.
Denmark	39,878	262,871	15·2 per cent.
Iceland	2,054	12,117	16·9 ,,

	Average yearly number of legitimate births.	Average number of married women between 20 and 50 years.	Proportion of legitimate births to 100 married women between 20 and 50 years.
Denmark	35,666	150,985	23·6 per cent.
Iceland	1,774	6,287	28·2 ,,

	Average yearly number of illegitimate births.	Average number of unmarried women between 20 and 50 years.	Proportion of illegitimate births to 100 unmarried women between 20 and 50 years.
Denmark	4,313	111,886	3·77 per cent.
Iceland	280	5,830	4·8 ,,

The proportion of boys born to girls, 105·7 per cent. in Denmark, and 106 in Iceland; and out of the whole number of births, 1·23 per cent. are twins, and ·015 per cent. are triplets in Denmark, whilst 1·43 per cent. are twins, and ·095 per cent. are triplets in Iceland.

It will hence be seen, that the fertility of the Icelandic women, both married, and especially unmarried, is a great deal greater than that of the Danish, but that the population, in point of fertility, is not so well composed as the Danish. In Denmark, the number of married women out of the whole number of fertile women is 57·4 per cent., while in Iceland it is only 51·9 per cent. It will be seen from the above table, that the number of male births exceeds that of female births in a higher degree in Iceland than in Denmark. I have already shown that the probable lifetime of the Icelandic females, in relation to the males, is still better than in Denmark: hence it will not excite wonder to find, that in the Icelandic population the proportion of the males to the females is as 1000 to 1120; while the proportion in Denmark is as 1000 to 1023. The proportion of still-born children is more favourable in Iceland than in Denmark; the proportion of still-born children to the whole number of births in the former being 3·3 per cent., and in the latter 4·4 per cent. The proportion of still-born males to the whole number of male births was in Iceland 3·6 per cent., in Denmark, 4·9 per cent.; and of still-born females to the whole number of female births in Iceland, 2·9, and in Denmark 3·8 per cent. It is also the case in Iceland as elsewhere, that this proportion is less favourable in the illegitimate births than in the legitimate.—*Ibid.*

Population of New South Wales.—An official document containing the statistics of New South Wales, including Port Philip, from 1840 to 1849, has just reached this country, and furnishes, from the complete and creditable way in which it has been got up, a remarkable view of the progress of that colony with regard to population. It appears in the 10 years nearly to have doubled; the total in 1840 having been 129,463, while in 1849 it was 246,299, of which number 101,470 were females. The proportionate excess of males was much greater in 1840 than at present; but the rapid diminution of the disparity is not to be attributed so much to the greater evenness of the subsequent immigration, as to the extended duration of female life compared with that of the other sex, and to the fact of the children born being more nearly balanced. Of 75,481 births since 1840, 38,310 were males, and 37,171 were females; while of 25,821 deaths amongst the entire population, 15,978 were males, and only 9843 were females. In deaths amongst adults, the number of men each year is nearly twice that of women, owing doubtless in a great degree to habits of intemperance. The number of marriages in 1849 was such as to indicate the returning prosperity of the country. After the commercial convulsion and the check to immigration, they had fallen from 2511 to about 1800, from which there was little variation until 1849, when the total was 2365. The year of the largest immigration was 1841, when it reached 22,483. The lowest year was 1846, after the land and banking disasters, when it fell to 402. In 1849 it was again large, and amounted to 19,340. The total immigration since the foundation of the colony appears to have been 107,403, of whom 82,933 were despatched at the public expense; the total paid from the territorial revenue, from 1832 to 1849, having been £1,309,447. Since 1839 the religions of the public emigrants have been recorded, and there appear to have been 46,869 Protestants, 23,337 Catholics, and 79 other denominations.—*Times*, 12 June, 1851.

Schleswig and Holstein.—The Hamburgh journals state, that an unusually high rate of mortality prevails among the Hungarian soldiers who form part of the garrison of Rendsburg, and that cases of suicide are also frequent among them. The Tyrolese regiments also suffered much when in the district,—the mountaineers of the South soon became afflicted with *heimweh*, and pine among the flat, sandy plains of the North.—*Ibid.*

The Irish Census.—Ireland has long been a mystery and an anomaly in the west of Europe. When it had existed for four centuries in a chronic state of anarchy and rebellion, the country was almost depopulated under the last of the Tudors and the first of the Stuarts. After the savage and sanguinary rebellion of 1641, it was conquered and chastised by Cromwell as few countries in historical records have ever been; and in the next generation the arms of the Prince of Orange again swept the land of its ill-fated inhabitants. If the returns made by Sir William Petty and Captain Smith may be trusted, the population fell one-fourth between 1672 and 1695. During the fifty years then drawing to a close, a large and influential settlement of English took place in the north. Manufactures were introduced by these new and industrious settlers; the old population was governed by the strong arm of authority; and, strangely enough, after the war with William, as had been the case after that with Cromwell, the country rose out of its depth of poverty and misery, agriculture and trade revived, and the counties of Ulster—hitherto a wild and desolate region—began to assume something of the appearance of Kent and Norfolk. Between 1695 and 1754, the population increased from 1,034,102 to 2,372,634. From this time there was a steady increase, the numbers for 1791 being returned in the hearth-money estimates at 4,200,612,—and those in the first census, that of 1821, at 6,801,827. From 1821 to 1831, the progress of population was rapid in the extreme for Ireland—the rise being no less than 965,574 souls, or about 14 per cent., in the decade. This, however, was the period of greatest increase. Between 1831 and 1841, the sum total of the increase fell to 407,723—or about 5½ per cent. In the last decade, just published in the census returns, we have the astounding result—not merely of a failure to maintain the old rate of progress, but of a vast positive decrease in the population. In 1841, the population of Ireland was in round numbers 8,175,000;—it is now, for 1851, returned at 6,500,000.

At first sight, these figures seem to tell an incredible tale. They startle belief by the novelty of the facts which they indicate. In the English mind, progress has become of late years an apparently fixed law of nature; and on finding a bold and emphatic denial of that onward rule in close proximity to our own shores, and in a country bound to us by so many ties, we feel our ideas rudely and painfully shaken. From the Caucasus to Norway, from the Ural Mountains to the Pillars of Hercules, there is probably no example of a similar decline on any large geographical surface during the last ten years. With all their revolutions, civil wars and bombardments, France, Germany and Italy have not suffered like Ireland. Disease has inflicted severe losses on several large cities of the Continent, and ravaged the lines of many navigable rivers,—fire and sword have scattered the population of fortressed towns like Arad, Brescia, Rastadt and Mantua,—but the aggregate quantity of human life has not been reduced to a large extent in any of these countries. In Ireland, not less than a quarter of the inhabitants has been cut off or removed in ten years—a fact with hardly a parallel in history. Cromwell's destroying sword and inexorable policy were as nothing to the more effective causes which have recently been in operation. His stormings and forced expatriations cleared the soil of some thousands,—the new victims of poverty, cholera, famine, fever, despair and emigration are to be counted by millions!—*Athenæum, July* 12, 1851.

Fires in Paris, and Accidents arising from them.—Pendant les six premiers mois de 1851, les Sapeurs Pompeurs de la ville de Paris ont été appelés à éteindre 966 incendies ou feux de cheminées, savoir :—

	Incendies.	Feux de cheminées.
En Janvier	30	171
Février	23	194
Mars	20	193
Avril	14	136
Mai	15	114
Juin	21	35
	123	843

Ces sinistres ont occasionné des blessures graves à trois sapeurs et à six habitans des lieux incendiés; en outre, vingt-cinq sapeurs ont été malades des suites de l'asphyxie qu'ils avaient éprouvée notamment de ces feux de cave. Deux de ces militaires ont été pour leur belle conduite décorés de la Légion d'Honneur, et plusieurs autres ont reçu des médailles d'honneur.—*La Presse*, 26 July, 1851.

CORRESPONDENCE.

LIFE-CONTINGENCY PROBLEMS.

To the Editors of the Assurance Magazine.

GENTLEMEN,—I now send you my solutions of the three Problems which I proposed in Number II. of the Magazine.

Annuities.—Taking that form of the Column System in which $N \div D = (1 + A)$, *i. e.* the value of a pre-annuity, or an annuity payable in advance, or at the *beginning* of each year, then $N_1 \div D = A$, or the ordinary annuity, may be considered as a pre-annuity *deferred* one year. In the same manner, an annuity payable by two equal instalments during the year may be considered as two deferred pre-annuities,—the one deferred six months, the other deferred twelve months; and (*generaliter*) an annuity payable by *n* instalments during the year may be considered as *n* separate pre-annuities severally deferred one, two . . . . . . *n* parts of the year. Hence, the formula deducible, according to the Column System, for an annuity payable by *n* instalments during the year would be $(N_{1:n} + N_{2:n} + N_{3:n} \ldots\ldots N) \div nD$. In place therefore of interpolating the original Table of Mortality, it will be sufficient to interpolate the values of N from N to N_1; and it is obvious this can be done to any degree of practical precision by aid of the calculus of Finite Differences, based on a sufficient number of collateral terms.

The ordinary and useful formula of adjustment by which an annuity payable by n instalments during the year is considered as increased in value by $\frac{n-1}{2n}$ parts of a year's purchase, we virtually owe to Simpson ("Annuities," p. 79): but its original demonstration, and the extended one inserted in Milne's (Art. 455–485) and other treatises, being rather vague, it is among the advantages of the Column System that it at once places the eligibility of this approximation in a clear light; for we have only to suppose the interpolations from N to N_1 to be in arithmetical progression, to arrive at a similar formula. Thus, remembering that an ordinary annuity *increased* by $\frac{n-1}{2n}$ parts, is the same as a pre-annuity *decreased* by $\frac{n+1}{2n}$ parts, and that $N-N_1=D$, we have $\frac{D}{n}=\Delta$ for the common difference of interpolation: hence the value of the annuity payable by instalments will, on this supposition, be

$$[(N-\Delta)+(N-2\Delta)+(N-3\Delta)\ldots\ldots\ldots+(N-n\Delta) \text{ or } N_1]\div nD,$$

which equals $\left(nN-(n+1)\frac{n}{2}\Delta\right)\div nD=(1+A)-\frac{n+1}{2n}$; for $n\Delta=D$.

Assurances.—The present value of any sum assured, payable with interest upon the death of A, is obviously equal to the sum assured itself, for no other sum will exactly produce a similar amount at interest. If then we put P as the single premium to secure £1 at death, $(1-P)$ is obviously the present value of the interest of the sum assured considered as a loan; and the value of the policy after n years will be found to be equal to the difference between the sum assured and the relation of the value of the original interest to that commencing at the later period, or the value of the policy will equal $1-\frac{(1-P_n)}{(1-P)}$. For $(1-P_n)=(1-v)(1+A_n)$, and $(1-P)=(1-v)(1+A)$: hence $1-\frac{(1-P_n)}{1-P}=1-\frac{1+A_n}{1+A}$, which is Mr. Griffith Davies' well-known formula for the value of a policy. We can also put $1-\frac{(1-P_n)}{(1-P)}$ into the form of $\frac{(1-P)-(1-P_n)}{1-P}=\frac{(P_n-P)}{(1-P)}$; or the theoretical value of a policy when a premium is due is equal to the difference between the two single premiums divided by the difference between the original single premium and the sum assured. It is also obvious from the preceding deductions, that the same relation obtains when stated in similar terms of the present value of the interest of the sum assured considered as a loan at the two periods; the increase of the single premium being exactly equal to the decrease in the value of the future interest.

Probabilities.—There may be said to be two principal methods of considering a "definite integral:" the one which regards it as a primitive function from which a certain differential co-efficient can be derived; the other which treats it as the determination of the limit to which the summation of an infinite series of functional values tends, when each term of the series is to be comprised between certain terminal values, and is, moreover, to be multiplied by the limit of magnitude to which the greater and greater subdivision of the difference between the limits of the variable ultimately points. Now, it is evident, that if the difference, as in the case proposed, between the limits of the variable be unity, that this common factor may be represented by $\frac{1}{n+1}$. The effect, therefore, is really equivalent to taking a certain proportion only of each term; and this effect is precisely that which is indicated when an average has to be taken, provided the proportion correspond to the number of terms, as it obviously does in a definite integral whose limits are zero and unity: for as n increases, the limiting ratio of $\frac{1}{n}$ to $\frac{1}{n+1}$, or $1 : \frac{1}{1+\frac{1}{n}}$, becomes more and more equal to unity. Now, whatever law of facility of error, or of deviation among a set of observations be supposed, it has been well shown by Professor De Morgan, (*Ency. Metrop.*, art. "Probab.,") that the average term and the most probable value approach nearer and nearer to an equality as the number of data or values increases; and this is precisely the same condition as that under which the value or summation of the definite integral more and more accurately represents the limiting value of the average term. It may also be seen, by reference to an article in the July number of the *Edinburgh Review* (No. 185, p. 19,) on Probabilities, said to be by Sir John Herschel, that the same conditions, above declared to be inherent in definite integration, and therefore in averaging upon the system of limits, have to be also stipulated for in the postulates, whenever the law of the results has to be determined in its utmost generality.

E. J. F.

[NOTE.—We have received from Mr. William Wylie, of the Colonial Life Assurance Company's Office, in Edinburgh, ingenious solutions of the first and third of these Problems.—ED. *A. M.*]

ON THE DETERMINATION OF SURPLUS.

To the Editors of the Assurance Magazine.

GENTLEMEN,—I have been very much gratified with the article in the *Assurance Magazine* on the Determination of the Surplus of a Life Assurance Company. It may perhaps interest some one to see the process which I have used for the same purpose.

It should be premised that it is the practice in the American Companies to assure at the age of the nearest birthday, so that no material error can arise from assuming the day of the date of the policy as the birthday of the party assured.

In the first place, I arrange the policies according to the year of birth, as in the article referred to, but grouping them according to the age at which they were assured, and the consequent premium paid: thus—

Born in the year ——.
Assured at the age x; premium for £1, p_x.

No. of Policy.	Date of Policy.	Decimal of a Year to Jan. 1.	Sum assured.	Product of the two Columns.
——	——	t_1	A_1	A_1t_1
——	——	t_2	A_2	A_2t_2
		&c.	&c.	&c.
		Σt_1	ΣA_1	ΣA_1t_1
Assured at the age $x+1$; premium for £1, p_{x+1}.				
——	——	t'_1	A'_1	$A'_1t'_1$
——	——	t'_2	A'_2	$A'_2t'_2$
		&c.	&c.	&c.
		$\Sigma t'_1$	$\Sigma A'_1$	$\Sigma A'_1t'_1$
		$\int$	$\int \Sigma A_1$	$\int \Sigma A_1t_1$

I here suppose the balance-sheet to be required for January 1st: if it is for any other date, the decimal of the year is taken from the date of the policy to that date; the column being easily filled up from a table previously prepared. The products (A_1t_1) I calculate to the nearest dollar; perhaps for the pound sterling they had better be calculated to tenths.*

Now, let V_{x+n} be the present value of £1 payable at death, at the age $x+n$; a_{x+n} the present value of an annuity of £1 at the same age. Then the present value of the first policy at the last birthday is A_1V_{x+n}; at the next birthday it is A_1V_{x+n+1}; and on the 1st January it is

$$A_1V_{x+n} + A_1t_1\,(V_{x+n+1} - V_{x+n}).$$

The value of the second policy, January 1st, is

$$A_2V_{x+n} + A_2t_2\,(V_{x+n+1} - V_{x+n}), \text{ \&c.}$$

The value of all the sums assured at the age x is

$$V = V_{x+n}\,\Sigma A_1 + (V_{x+n+1} - V_{x+n})\,\Sigma A_1t_1\,;$$

and the value of all the sums assured of those born in the same year is, on 1st January,

$$\int V = V_{x+n} \int \Sigma A_1 + (V_{x+n+1} - V_{x+n}) \int \Sigma A_1t_1\,.$$

It will be observed that the only difference in the labour of obtaining this true value, and an approximate one, is that employed in filling the columns for t_1 and A_1t_1,—a labour which requires no repetition. If the third column had indicated the exact day of birth, the result would have been mathematically exact.

Again, the present value of the future payments, after the last payment was made on the first policy, was $A_1p_x a_{x+n}$; immediately before the next payment is made, it will be $A_1 p_x(1+a_{x+n+1})$; and on the 1st January it is

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* It should be remembered that the columns t_1 and A_1t_1 are constant while the policy is in force, the footings only having to be corrected from year to year as the policies lapse.

$$A_1 p_x a_{x+n} + A_1 t_1 p_x(1+a_{x+n+1}-a_{x+n}).$$

The value of the future payments on the second policy, January 1st, is

$$A_2 p_x a_{x+n} + A_2 t_2 p_x(1+a_{x+n+1}-a_{x+n}), \text{ \&c.}$$

The present value, January 1st, of the future premiums on all the policies issued at the age x, on lives born in the year ——, is

$$v = a_{x+n} p_x \Sigma A_1 + (1+a_{x+n+1}-a_{x+n}) p_x \Sigma A_1 t_1.$$

The corresponding value for those issued at the age $x+1$ is

$$v' = a_{x+n} p_{x+1} \Sigma A'_1 + (1+a_{x+n+1}-a_{x+n}) p_{x+1} \Sigma A'_1 t'_1, \text{ \&c.}$$

The sum of all these values is

$$\int v = a_{x+n} \int p_x \Sigma A_1 + (1+a_{x+n+1}-a_{x+n}) \int p_x \Sigma A_1 t_1.$$

I use the true values of V_x and p_x, and apply an appropriate "loading" to $\int V$ and $\int v$, the amount of which must depend on the nature of the risks, and must be estimated for each particular Company.

I have pointed out how the exact value of all the sums assured may be obtained, when the system of assurance is such that the date of the policy cannot be taken for the date of birth. For the present value of the future payments in such cases, the exact formula is more complicated, inasmuch as both dates must be elements of the calculation. I have no doubt, however, that a formula may be obtained by which this value may be approximated to within strictly defined limits.

I ought to mention that I have found the columns t and At very useful in estimating the probable mortality in a Company in a financial year.

Your obedient Servant,

C. GILL.

Mutual Life Assurance Company,
New York, June 1851.

[NOTE.—In our article on this subject, we strongly insisted on the very small difference arising between the results of a class valuation, and one in which each policy has been separately valued. The following remarkable confirmation of this has been handed to us by a friend. It occurred in a Company in which the sums assured amounted to £2,689,719, and the annual premiums to £81,225.

			£
Value of the sums assured, each policy being separately valued			1,576,411
Do. of future premiums,	do.	do.	902,553
			£673,858
			£
Value of the sums assured, the policies being valued in classes			1,576,521
Do. of future premiums,	do.	do.	902,839
			£673,682
		Difference	£176

The arrangement pointed out in our correspondent's letter is highly ingenious, and would no doubt meet the exigencies of the case; but the additional labour would be considerable, inasmuch as the column $A_1 t_1$ *would have* to be calculated afresh at each valuation, on account of the bonus additions,—a circumstance which appears to have escaped our correspondent's observation.—ED. *A.M.*]

Epidemiological Society.—We have received from the Honorary Secretaries of the Epidemiological Society the rules and regulations of that Society, with an exposition of its objects; also the printed queries issued by the Small-pox and Vaccination Committees, and those of the common Lodging-house Committee. In our next Number we will lay before our readers the more prominent questions contained in the papers sent to us, which came too late to be further noticed at present. The establishment of a Society amongst the medical profession for inquiries into the numerous topics affecting sanatory and vital statistics, on which the experience and talent in that profession can, if well directed, throw so much light, is a circumstance of considerable interest; and we think that such a Society well deserves the support and active assistance of all who desire to throw aside theories based on mere idle speculations, and to draw their conclusions only from the comparison of, and reasoning upon, well-established facts. In the meantime we refer our readers to Dr. Babington's letter in our last Number for a brief epitome of the plan of the Society, and the intentions of its founders.

REVIEWS OF NEW WORKS.

Industrial Investment and Emigration: being a Treatise on Benefit Building Societies, and on the general principles of Associations for Land Investment and Colonization. With an Appendix on Compound Interest, Tontines, and Life Assurance. By ARTHUR SCRATCHLEY, M.A., Actuary to the Western Life Assurance Society. Second Edition, much enlarged. London: J. W. Parker, West Strand. 1851.

THE labours of Mr. Scratchley in this now widely-extended field are familiar to the public. It is to him, indeed, that the system upon which building societies are founded, mainly owes its purification from the most dangerous fallacies, and a much more perfect organization at the present day. In the first edition of his work, published in 1849, Mr. Scratchley laid down the principles upon which building societies must be based to have any chance of ultimate success, and exposed very completely the all but universal departure from those principles which characterised the existing ones. Since the publication of that treatise a very material improvement has, we believe, taken place,—not only as regards the condition of societies already established, but the mode in which new ones have been constructed; and we have thus the best evidence of the great utility of such works as that now before us. But in the present publication, Mr. Scratchley has greatly extended his original plan: whereas the former was confined to the consideration of Benefit Building Societies, Terminating and Permanent, their constitution and management, and to the investigation of the theories upon which they depend; the present treats, in addition, of Freehold Land Societies, Tontine Associations, Freehold Life Assurance, and Benefit Emigration and Colonization Societies; ample information being given as to the nature and constitution of each of them, and useful suggestions for their improvement and extension. In the Appendix the elementary propositions of the doctrine of Compound Interest are clearly laid down, and several theorems connected with the subject are also deduced, which are not less remarkable for their originality than their great practical utility. Thus it is shown at p. 243, that the number of years in which a sum of money will double itself at compound interest is, in round numbers, equal to the quotient of 70 divided by the rate of interest per cent. very nearly. So that at 5 per cent. a sum will become double in $\frac{70}{5}$, or 14 years; at 4 per cent., in $\frac{70}{4}$, or 17½ years, and so on; and this is a close approximation for all rates not exceeding 10 per cent. Again, it is demonstrated, at p. 257, that $\frac{1}{P_n} - \frac{1}{A_n} = i$, or $\frac{1}{P_n} - i = \frac{1}{A_n}$; and since we have tables at all rates of $\frac{1}{P_n}$, or the annuities which £1 will purchase, we can obtain the annuity which will amount to £1 in n years by merely deducting the interest, and hence by simple inspection determine at once all the relations on which the value of any temporary investment depends. At a subsequent page, Mr. Scratchley shows that if a sum of money be borrowed for such a time, that it would amount at the expiration of it to f-fold its original value; then, the annuity which would pay it off, principal and interest in the same time, is equal to $\frac{f}{f-1}$ times one year's interest on the debt—a theorem of the utmost utility to building societies. Thus, in one of the ordinary kind, the monthly payment for the £60 share is readily found, by its means, to be ten shillings, or twice the interest for one month.

But amongst its more minute features, nothing has struck us as more ingenious in Mr. Scratchley's work than the demonstration at p. 294, *that the value of a share in a tontine is independent altogether of the probability of the life involved surviving to the time of division.* This is a deduction sufficiently evident when pointed out, but one which would present itself at the first glance as extremely unlikely to be true. Our space will not admit of more particular allusion to the many other useful theorems contained in this part of the work; suffice it to say that the book is indispensable to building societies, and one which no association of a financial character should be without. To the student it will present many new problems, and many with which he is familiar, in a novel and instructive point of view; whilst in some of the notes he will find matter to exercise analytical powers of no mean order.

Letters addressed to H.R.H. the Grand Duke of Saxe-Cobourg and Gotha, on the Theory of Probabilities as applied to the Moral and Political Sciences. By M. A. QUETELET, Astronomer Royal of Belgium, Corresponding Member of the Institute of France, &c. Translated from the French by OLINTHUS GREGORY DOWNES, of the Economic Life Assurance Society. London: Charles and Edwin Layton, Fleet Street. 1849.

THE theory of probabilities has attracted the notice of so many men of the first eminence in science, that the works in which their profound speculations and analysis are developed are not found in the hands of many who yet are daily using their results. Such deep thinkers as Pascal, Leibnitz, Huygens, the Bernouillis, D'Alembert, Condorcet, and Laplace, may be easily supposed to have reasoned on such topics in a manner which would be beyond the reach of ordinary mathematicians. Yet the subjects to which these doctrines could be applied are so numerous, and of such high interest, both in moral, political, and social statistics, that a practical and elementary work, introductory to the great authors we have above named, could not but be deemed of the highest utility. The well-known talents and varied acquirements in science and social economy of the learned and indefatigable author of this book, would lead us to expect that many important questions would be discussed, and that the illustrations of the theory would be drawn from some of those recent discoveries and practical inquiries into the moral and social conditions of countries, which do so much honour to the present age. We are not disappointed. The examples of the employment of arithmetical means are shown in the price of wheat, and the limits of the variation of price, and in the mean and extremes of temperature of a day at Brussels, with the monthly and annual variations; of the theory of means, and the probable error, in the observations taken at Greenwich, for determining the time of the right ascension of the polar star; of the question whether the arithmetical mean is the true mean in the measurements of the chests of Scottish soldiers, as recorded in the *Edinburgh Medical Journal*, and the heights of French conscripts; of reasoning from particular to general facts, in the blooming of flowers in different temperatures and degrees of latitude; and so on through a multitude of useful and novel inquiries in science and art. This method of uniting the elucidation of the theory with practical examples from the most recent statistics in various branches of knowledge, has the double advantage of rendering the study more interesting, and, at the same time, exciting the student to that application of his knowledge to the affairs of life, without which he would be a mere vain and useless theorist. This is an utilitarian age. No man is now allowed any credit for indulging in idle speculations and closet fancies. The wonderful discoveries which have been made in the last quarter of a century, are probably owing in a great measure to that general diffusion of knowledge, and that popularizing (if we may use the word) of the works of the highest intellects, and bringing them within reach of the practical man of business and actual experience, which M. Quetelet has so ably accomplished in the above work for a very important department of science. The fourth division of this book is devoted to remarks on the science of observations, the objects of statistics, and the methods of combining and checking, and the manner of using statistical documents both in the various questions of legislation and political economy; and what is practically of great importance to most of our readers, the means of collecting medical data. At a time when the old prejudice against the use, or rather the abuse, of figures and facts is fast wearing away, the judicious and reasonable view which our author takes of the value of observations properly made and well selected, will be read with great and increasing interest.

The translation of this useful work by Mr. Downes is made in general with great judgment, and in a simple, easy, and elegant style, which permits his version to be perused with greater pleasure than translations generally afford to the reader. Here and there words or phrases may be noticed which probably with longer time for preparation might have been altered into more idiomatic English; such, for instance, as "revoke in doubt," for "call in question" the benefits of science. The "modest" produce of his labours, for the "moderate" produce. "Parties" is translated "parts," when the application is to the "games" of war. "On aurait lieu de plaindre un pays" is translated "he would have to complain of a country;" instead of being rendered "a country would be to be pitied," &c. But these are slight faults, and are only noticed lest they should escape detection in a reperusal for another edition. The work itself is got up in a very superior style; and the printing of the tables and the diagrams in the notes particularly deserve to be mentioned with praise.

Single and Annual Assurance Premiums for every value of Annuity on Single or Joint Lives or Survivors, adapted to any Table of Mortality at 2½, 3, 3½, 4, 4½, 5, 6, *and* 7 *per cent. Also a table for the formation of Half-yearly and Quarterly Assurance Premiums.* By William Orchard, A.I.A. London: W. S. D. Pateman, Wine Office Court, Fleet Street. 1850.

To those who are conversant with the subject, the title alone of this work will be no small recommendation. It was a very happy thought of Mr. Orchard's to exhibit values for every possible annuity afforded by any mortality table, combined with the above rates of interest, by giving them for every number from 0 to the number which nearly expressed the value of a perpetuity. Mr. William Wood seems to have entertained the same idea previously to Mr. Orchard; but there is no doubt that the latter came upon it quite independently. Whatever praise, however, is due on the score of the conception, we think the mode in which it is carried out is entitled to still higher commendation. Nothing can be more simple and convenient than the arrangement adopted. We believe it would be scarcely possible to improve upon it. To have made the "regular series," as Mr. Peter Gray would call it, consist of more than three figures, would have greatly increased the bulk of the book, and made references in it troublesome; by limiting the series to three figures this is avoided, whilst the "proportional parts" thus required for the fifth figure, are so arranged as to be got at with the utmost facility. Great care seems to have been taken to attain a perfect accuracy, and every appliance made use of with that object, which considerable mathematical attainments, and great familiarity with the various processes needed, were able to supply. Such tables as these are invaluable, not only on account of the labour which they save, but for their obviating so completely the liability to error which must always present itself in making even the simplest calculation.

Works recently published:—

Caisse de Retraites et Pensions Viagères pour la Vieillesse. Paris. 1850.

Church Leases. By W. H. Grey, Accountant and Arbitrator, Associate of the Institute of Actuaries of Great Britain and Ireland, and Secretary to the Committee of Members of the Committee of the two Houses of Parliament on Church Leases. London: J. Ridgway, Piccadilly. 1851. 2*s.* 6*d.*

Etudes Statistiques sur la Mortalité et la Durée de la Vie dans la Ville et l'Arrondissement de Dijon, depuis le 17ᵉ Siècle jusqu'à nos jours. By M. C. Noirot, M.D.. Paris: J. B. Baillière, Rue de l'Ecole de Médecine. Dijon: La Marche et Drouelle, Place St. Etienne.

Medical Combinations against Life Assurance Companies. London: Orr & Co. 1851. 1*s.*

Statistical Journal. Vol. XIV. London: J. W. Parker. 2*s.* 6*d.*

Part I., March, 1851. — Vital Statistics of Ireland. By P. A. Schleisner, M.D.—Contribution to the Vital Statistics of Scotland. By James Stark, M.D., F.R.S.E., Fellow of the Royal College of Physicians, Edinburgh.

Part II., May, 1851.—Mortality and chief Diseases of the Troops under the Madras Government, European and Native, from the years 1842 to 1846 inclusive, compared with the Mortality and chief Diseases of 1847. By Lieut.-Col. W. A. Sykes, F.R.S.

The Property and Income Tax the Best Tax for the Community, &c. By E. Erskine Scott, Esq., F.I.A., Actuary of the East of Scotland Life Assurance Company.

INSTITUTE OF ACTUARIES.

Having in the three preceding Numbers of the *Assurance Magazine* given an epitome of the Reports, so far as they have been published, of the Assurance Companies of Great Britain in various branches of the business for one entire year, from September 1849 to September 1850, we had intended in this and following Numbers to have continued the series to the latest date. The importance, however, of the Meeting which was held in the rooms of the Institute, and the dinner which was given to the representatives of Assurance interests in foreign countries, and to other distinguished men in this country who have devoted themselves to sanitary statistics, and other questions of social and political economy, in which actuaries ought to be conversant, will prove, we hope, a sufficient apology for devoting the remainder of our space to give as complete a report as we can put together of the proceedings of the 5th of July.

No one who took part in these proceedings can hesitate to believe that very important consequences are likely to result from what at first might appear only a social and festive meeting. The extraordinary activity and energy with which the business of assurance in some branches has been prosecuted on the Continent has but lately become known in England; and we must confess that the information obtained in reply to our inquiries has affected us with somewhat of surprise as well as gratification. The talent, cultivated intellect, and commercial enterprise of the distinguished visitors, many of whom on this occasion had made a long journey expressly to be present at the Meeting, have left behind them a feeling of respect and esteem, which we are confident will increase as other opportunities occur of cultivating an acquaintance so auspiciously commenced; whilst the genuine good feeling with which our advances were received, is unequivocally evinced by their desire to promote the objects of the Institute, and to make those researches by which our collections of facts may be improved, and the theory of probabilities applied more extensively in practice. We trust that the result will be, that not merely will the solutions of many difficult problems in vital statistics be obtained from the accurate and varied data thus brought under review, but that many other subjects which are now left to the chance of individual experience, and sometimes even exposed to the risks of the pretending or the deceptions of designing men, may be reduced to order and simplicity, and be governed by the rules of pure and accurate science.

Amongst a large number of the Members of the Institute, there were present at the conference the managers of some of the principal Life, Fire, and Maritime Assurance Companies, or other men of science who had taken an interest in sanitary or vital statistics, in France, Austria, Prussia, the German States, Russia, Holland, Belgium, and America. The only thing to be regretted was that longer time could not be devoted to the discussion, and to the reading of the papers which were presented to the Meeting. We have, however, given some of these *in extenso*, together with a translation of an interesting paper in German, prepared expressly to be laid before the Meeting, by Herr Masius, a distinguished writer in Leipzig; who, besides other publications on the subject, for some years conducted a journal devoted to assurance questions, under the title of *Allgemeine Versicherungs Zeitung*, and now edits a monthly periodical of a similar kind, the *Rundschau der Versicherungen*. This paper contains, as will be seen, a complete summary of all branches of assurance as now carried on in Germany. M. Dubroca, the talented editor of the *Revue des Assurances*—a periodical now in the seventh year of its publication—in Paris, and which we have so often found it necessary to quote in these pages, was present at the Meeting, having come, with other distinguished managers of French Companies, expressly to do honour to the occasion; so that both the literature and the practice of assurance might be considered as worthily represented.

As these Meetings form part of the Proceedings of the Institute, we place the account of them in the order in which they naturally fall, viz., immediately subsequent to the sessional meeting held in June.

PROCEEDINGS OF THE INSTITUTE.

Sixth Sessional Meeting, 1850–51.—*Monday 28th April*, 1851.

PETER HARDY, Esq., F.R.S., V.P., in the Chair.

The Minutes of the last Sessional Meeting having been read and confirmed, the Vice-President announced the following contributions to the Library, viz.:—

	Presented by
Chess Problems. By W. Lewis, 1827.	The Author.
Fifty Games at Chess. By W. Lewis, 1832	Do.
The Match at Chess played by the London and Edinburgh Chess Clubs 1824-28. By W. Lewis, 1828	Do.
A Treatise on the Game of Chess. By D. Pietro Carrera. Translated from the Italian by W. Lewis, 1822	Do.

The following Candidates, duly proposed at the last Sessional Meeting, were elected Associates of the Institute, viz.:—

Joseph Clarke.
Bryan Edward Cookson.
John Edward Tresidder.

Mr. Pinckard read a paper "On the Practice and Experience of the Clerical, Medical, and General Assurance Society, chiefly with regard to Invalid Lives."

The Vice-President stated to the Meeting that he had been deputed by the Council to announce to the Members that, as on the occasion of the Great Industrial Exhibition it was probable that many foreign gentlemen connected with Continental Societies for the Assurance of Lives, and of Fire, and Maritime Risks, would be in England about the period of the Anniversary Meeting and Dinner of the Institute, they had put themselves in correspondence with a great number of these gentlemen, and had invited them to partake of the hospitality of the Institute. To these invitations many answers in the affirmative had been received, and the Council had formed themselves into a Committee, with power to add to their number, for the purpose of making the necessary arrangements. The Vice-President added, that the Committee thus formed would gladly receive any suggestions in writing from the Members generally, supposing any of them should be disposed to assist the Council in their labours.

Seventh Sessional Meeting, 1850–51.—*Monday, 26th May*, 1851.

PETER HARDY, Esq., F.R.S., V.P., in the Chair.

The Minutes of the last Sessional Meeting having been read and confirmed, the Vice-President announced the following presentations to the Library, viz.:—

	Presented by
May (J. E.), A Treatise on the Law, Privileges, Proceedings, and Usage of Parliament	Mr. Laurence.
Scratchley (A.), A Treatise on Benefit Building Societies. Second Edition. 1851	The Author.
Grey (W. H.), On Church Leases. Third Edition. 1851 (2 copies)	Do.
Latham (H.), Geometrical Problems	Do.
Jones, On Book-keeping. Part I. Fifth Edition	Mr. Orchard.
Ditto Part II. Seventh Edition	Do.
Bradley's (T.) Practical Geometry. 1834	Mr. Bailey.
Lacroix (S. F.), Essais de Géométrie. 1822	Do.
Newton's Principia, Sections 1, 2, 3, 9, and 10. Edited by J. H. Evans, M.A. 1837	Do.
Quetelet, On Probabilities. 1849	Do.

Mr. Jellicoe then read a paper "On the proper Allowance to be made for the Surrender of Policies of Assurance."

Annual General Meeting, 1850–51.—*Saturday, 7th June*, 1851.

PETER HARDY, Esq., F.R.S., V.P., in the Chair.

The Minutes of the last Sessional Meeting having been read and confirmed, the Secretary read the circular convening the Meeting.

The Treasurer's statement of the Receipts and Expenditure for the financial year ending the 30th April last was read.

The President, Council, and Officers for the year 1851–52 having been elected, the following Bye-Laws were discussed and adopted, viz.:—

> "That no person shall be admissible to the Institute unless he be approved by the Council."

(The Bye-Law announced at the Fourth Sessional Meeting being annulled,) That the following words be added to Clause IV. of the Constitution and Laws of the Institute:—

> "And in the latter case he shall remain ineligible for renomination till the next Session."

That Clause XX. be altered and stand thus:—

> "Any Member whose annual subscription shall be in arrear for two months shall be applied to in writing by one of the Secretaries, and shall be incapacitated from voting at the Meetings of the Institute, or exercising any other of the rights of a Member, until such subscription be paid; and if the same be not discharged before the first Saturday of May next following, he shall be declared a defaulter, and shall cease to be a Member of the Institute."

That in future the Annual Meeting be held in July instead of June.

That in Clause XL. the words "four or more Members of the Institute, of whom a moiety at least shall be Fellows," be substituted for the words "two Fellows, an Official Associate, and an Honorary Member, or in lieu of the last a third Fellow."

That the following words be added to Clause XLI.:—

> "And it shall consist of three parts, separated from each other by an interval of at least one year, and no Member shall be eligible for the final examination unless he shall be of the full age of twenty-one years."

Eighth Sessional Meeting, 1850–51.—*Monday, 30th June,* 1851.

CHARLES JELLICOE, Esq., V.P., in the Chair.

The Minutes of the Annual General Meeting having been read and confirmed, the Vice-President announced the following contributions to the Library, viz.:—

	Presented by
Gill (C.), On the Application of the Angular Analysis to the Solution of Indeterminate Problems of the Second Degree. 1848	The Author.
Sylvester (J. J.), An Essay on Canonical Forms. 1851	Do.
Lafond (G.), Guide de L'Assureur et de L'Assuré en Matière D'Assurances Maritimes. Paris. 1837 .	Do.
Lafond (Le Capitaine Gabriel), Quinze Ans de Voyages autour du Monde. Paris. 1840. (2 copies) .	Do.
Joliat (M. H.), Journal des Assurances from 1831 to 1840 inclusive. Paris. 6 vols.	Do.
Babbage (C.), Table of Logarithms of the Natural Numbers from 1 to 108,000. Stereotyped. 1829 . .	Mr. Farren.
Logarithms, Tables thereof. 1839	Do.
Tarif des Retraites ou Rentes Viagères. Paris. 1851	M. Guerry.
Vanhoorebeke (L. Bastiné et E.), Observations sur le Systême des Assurances par L'État. Bruxelles. 1847	M. Flemmick.
Langheinrich (W. A.), Zwei Tabellen zur Schnellen und Sicheren Berechnung der Zinser-Zinsen. Erfurt. 1851	Herr Lobeck.
Quetelet (M. A.), On the Theory of Probabilities. Translated from the French. By O. G. Downes. 1849 .	Messrs. Layton.
Caswall's (A.) Treatise on Copyholds. Third Edit. 1841	Do.
Newton's (Sir I.) Principia, Commentaries thereon. By the Author of "A New Theory of Gravitation." 1846	E. Cheshire.

Mr. Frederick Hendricks, Actuary to the Globe Insurance Company, was unanimously elected a Fellow of the Institute.

The Vice-President announced that the Council had received from the Examiners their Report of the result of the Examination for 1851, and that he had much pleasure in stating that all the candidates had been found duly qualified, and entitled to receive the usual certificates of competency. The names of the candidates, in alphabetical order, were as follow, viz.:—

Edward Cheshire, 12, Chatham-place, London.
Christian Child, Alliance Life Assurance Company, London.
Alexander Colvin, United Mutual Mining and General Assurance Society, London.
James Meikle, Scottish Provident Institution, Edinburgh.
Henry Thomson, Jun., Northern Insurance Company, Aberdeen.

Mr. Samuel Brown then read a paper "On the recent Progress of the Assurance of Life and Property on the Continent."

General Meeting of the English and Foreign Representatives of Assurance Interests, held at the Rooms of the Institute on Saturday, July 5th, 1851.

CHARLES JELLICOE, Esq., V.P., in the Chair.

The Chairman rose and said:—"Gentlemen, the variety of important subjects connected with our common pursuit is so great that many days would not suffice to discuss them, much less two hours. It has been thought, however, highly desirable to seize the opportunity afforded by the presence of our foreign friends to elicit at least some of their opinions; and the two questions about to be brought under consideration have been selected as lying at the very foundation of almost all our investigations. As we are all anxious to hear those gentlemen who have come so far to favour us with their presence, I will at once call upon Mr. Neison to open the discussion on the first question, viz.:—

'What are the principal existing data, here and abroad, to which the doctrines of Probability may be applied (with a view to organize systems of Assurance), and from what sources can better be obtained?'"

Mr. Neison.—"Mr. President, I have considerable diffidence in venturing without preparation to open the discussion of so comprehensive and important a question, and I feel this difficulty the greater from the presence of so many learned and distinguished visitors, who may be led to expect a greater amount, variety, and novelty of facts, information, and principles than I shall be enabled to bring under your attention within the limited time assigned for the introduction of this debate. There can be little doubt that the two questions now propounded comprehend almost the whole range of studies which fall strictly within the sphere of the Actuary's duties as hitherto required of him by society, and it would be evidently fruitless to attempt anything like a full elucidation of the principles which should guide him in the practical application of the physical or monetary laws embraced in the propositions proposed for discussion, or to enter fully on the difficulties connected with the practical application of those principles, and the suggestions which might be offered for the improvement and augmentation of the data, and doctrines deducible therefrom, necessary to give permanence and significance to the mission and status of the Actuary. I shall hope therefore to be excused, under the circumstances, for any abruptness which may appear in the few brief remarks which I shall now submit for the consideration of this meeting. Since entering this room it has been observed to me by Professor Friedländer, that a remarkable improvement has taken place in the duration of life, particularly among the middle classes, during the last sixty or seventy years. My friend is not singular in holding such an opinion, for it is equally entertained by other distinguished authorities on vital statistics. Still there is strong reason to hesitate in the adoption of such views, and it would be well to consider on what grounds they are generally held, and the authority and evidence on which they rest.

"Without entering on the history of the early progress of inquiries on the rate of mortality among different classes, I believe the purposes of the present discussion will be sufficiently served by retracing our knowledge on this subject from the period of the most active and successful efforts made to impress on society the importance of having strict regard to well-ascertained laws of mortality in pecuniary transactions on life. The honour of this great achievement in human knowledge belongs to the celebrated Dr. Price, and to his writings is mainly traceable the origin of the opinion, that in recent years the duration of life is much prolonged. The well-known Table of Mortality, usually, although erroneously, called the Northampton Table, and which is based on facts relating to the middle of the last century, exhibits a certain duration of life, and for a long time this table continued to have undivided sway and authority in the estimation of writers and those engaged in assurance transactions, as indicating a near approximation to the rate of mortality among certain classes of the community. At last, however, the late Mr. Milne brought under public attention the Table of Mortality known as the Carlisle Table, and although the data embodied in this table had reference to a period not much subsequent to the time to which the data of the Northampton Table relate, still, from its more recent promulgation, the impression produced on the public mind was that which would naturally arise from other scientific writings, that each table represented the state of the science at a period near to the date of its appearance.

"The remarkably increased duration of life evidenced by the Carlisle Table over the Northampton could not fail to arrest public attention, and the elaborate and able work in which Mr. Milne had issued his table into the world, claimed for it an information and consideration not before conceded to even the labours of Dr. Price himself. An examination of the writings of this period will at once satisfy any inquirers that in a very short time after the appearance of Mr. Milne's work, the Carlisle Table began to grow in favour and public estimation, and hence, from the misconception that its recent appearance was evidence also of the recent origin of its data, and from the increased duration of life deducible from it, an opinion prevailed that, since the appearance of Dr. Price's writings, an improvement had taken place in the public health. This impression has continued to gain ground until the present hour. It is consequently important to test the correctness of this opinion, not only from its bearings on recent legislative proceedings, but also from the remarkable hold which both classes of results have taken of the assurance interests of this country, as well as of the continent. At first glance it must be evident that, from the almost cotemporaneous but remote origin of the data of both tables, the observable difference in their rates of mortality could not be held to show any improvement in the duration of life in the recent more than in the remote ones. Besides, if a difference really does exist in their rates of mortality, that difference can be supposed to be only due to the local circumstances and influences peculiar to the small districts from which the data were collected, and, however true the results may be considered in regard to the districts so represented by the data, it is impossible from their evidence alone to regard either as a type of the rate of mortality prevailing at a former or the present period among either the assurance classes here or elsewhere, or as affording any evidence of the rate of mortality in the country generally, or in individual classes of the population.

"Having said this much on the influence which the Northampton Table has exercised on the public mind, it is a very curious but mortifying circumstance to discover at this advanced stage of our progress that the gigantic monied interests of our greatest companies have long relied, almost exclusively, on a table which has been falsely constructed, and which, in fact, does not represent the rate of mortality in the locality from which the data have been collected, nor, as will hereafter appear, the rate of mortality in the country generally, nor among the assured portion of the community. The Appendix to the Eighth Report of the Registrar-General contains one of the most valuable and interesting papers ever published in connection with the Northampton Table. Not only in an historical point of view, but also on account of its practical applications, the paper is one of first importance to Life Offices. To the author, Mr. Farr, the assurance interests of this country must be considered deeply indebted. At the period when Dr. Price constructed the celebrated Northampton Table, he did not possess all the elements necessary to determine correctly the rate of mortality in the locality under investigation, and to supply the defective element he had recourse to an hypothesis which recent inquiries have proved to be erroneous. This should not be considered in the light of a reflection on Dr. Price, for there is reason to believe that with the imperfect materials at his command it would have been difficult to have followed a better plan than that which he adopted; but still Mr. Farr has been enabled to advance historical evidence to show that the hypothesis was a fallacious one, and that consequently the rate of mortality deduced therefrom is also erroneous. From the deaths which have taken place in 'All Saints'' parish, Northampton, during the seven years 1838-44, being the same district to which Dr. Price's facts relate, Mr. Farr has constructed a Table of Mortality on the plan adopted by Dr. Price in the construction of his Table for the 46 years 1735-80; and although an interval of sixty years has elapsed between the periods to which each class of facts belongs, still it is curious to find that little or no change has taken place in the rate of mortality, and the one table might be used for the other. It is, however, important to understand that the method followed by Dr. Price in the construction of his table is now admitted by all authorities to be wrong; and any one who at this time would venture upon a similar course must necessarily sacrifice all public esteem for scientific accuracy. The parallel table by Mr. Farr has been purposely constructed on the same plan, and the results of both agree so closely that it is impossible for any one to argue therefrom that since the middle of the last century any improvement whatever has taken place in the duration of life in Northampton. Mr. Farr has, however, not stopped at this stage of the inquiry, but has gone further. He has formed a table on true principles from the data referred to for the seven years 1838-44, and the results arrived at do not differ widely from the rate of mortality shown in Mr. Milne's Carlisle Table, and other tables more recently promulgated. If therefore the facts treated by Mr. Farr, on true principles show so great an improvement in life, there is every reason to believe that the materials with which Dr. Price had to deal would also have shown similar results had they been properly treated, and consequently, so far as the Northampton and Carlisle Tables are concerned, there is no reason to believe that any augmentation has taken place in the duration of life during the last hundred years.

"The Northampton and Carlisle Tables have been dwelt on from the importance they have assumed in the practice of Life Offices. There are, however, other local tables, as the Chester and others, to which reference might be made if necessary. Proofs of the like stability in the rate of mortality may also be derived from observations of large masses of mankind. The mortuary registers of Sweden in a very complete form go as far back as the year 1751, and up to the present time no improvements appear to have taken place in the duration of life. The results for that kingdom, for the last 100 years, do not appear to differ much from the rate of mortality in this country during the last 10 years. Again, in France, if the tables of Demonferrand are to be relied on, the value of life there does not differ in any material degree from that indicated by either of the other classes of results. It is however right to remark, that the French people, although so much advanced in scientific knowledge and civilization, are still indifferent to the advantages of a proper census of the people; and M. Demonferrand has been compelled, owing to the ages of the population being unknown, to resort to an expedient in the construction of his table, which may probably not affect its value in any material degree. As far therefore as Life Offices are concerned, it does not yet appear that we possess any data which bear directly and intimately on their risks. Life Offices in this country have had their transactions almost exclusively with the middle and upper classes; and the same remark is to a great extent applicable to the experience of Companies on the Continent and in America: therefore, whatever value may be attached to any of the mortality tables hitherto referred to, they cannot in the absence of other evidence be considered as applicable to the purposes of Assurance Companies. The public is indebted to our President, Mr. Finlaison, for what is called the Government Tables; but these, irrespective of inherent evidence of anomalous conditions, could scarcely be thought applicable to the purposes of a Life Office; for as the bulk of the data has reference to a remote period of years, if any value is to be attached to prevailing opinions on the recent improvement of life, the data must be wholly inapplicable to the present time. It may also be here remarked, that the tables usually quoted as the Government Tables are not those based on the corrected and revised data of 1829, but those given in the reports of 1824; and what the public really speak of as being the Government Table is not in fact that finally adopted.

"We have, however, tables derived directly from the experience of Life Offices, the Equitable and Amicable Societies; but the bulk of the facts of both tables relates to remote years, and, therefore, if any importance is to be attached to the recent improvement in life, they are clearly not applicable to present operations of Assurance Companies. There is likewise the table usually denominated the "Experience Table," deduced from the recorded observations of seventeen Life Offices reported on by the Committee of Actuaries appointed in the year 1839. In these observations, like those deduced from the Amicable and Equitable Life Offices, the bulk of the facts has no reference to recent years; but there is a much more serious objection to be brought against the results given in the "Experience Table." From the indisposition evinced by the Contributary Offices to let their individual experience be known even to the members of the Committee to whom the inquiry was intrusted, it became necessary that the different schedules should be submitted in an anonymous form,—all were given with blank headings, and so completely mixed up together, that it was impossible afterwards to determine from what Office any particular schedule came. This arrangement prevented the investigation being any other than one confined to the policies issued by those Offices, and not an estimate of the mortality among a certain number of lives. To those therefore of even limited experience, it must be obvious that the results are thereby deprived of all value, as indicating the rate of mortality among the Offices contributing the facts. Nothing is more notorious than the frequency with which the same life is assured in duplicate and triplicate, not only in the same Office, but in several Offices; and it often happens that on the same life there has at one time or another been issued as many as from 20 to 50 policies, in the different Offices conjointly. To take an extreme example, in order to show the nature of the principle, and its effect in vitiating the truth of any results derived from a calculation founded on the number of policies, and not upon the number of lives,—it is well known in most of the Assurance Offices, that a distinguished personage was so fully assured in the Life Offices in this kingdom, that it was impossible to obtain any further policies on his life from Assurance Companies; and it has been said that recourse was had to Lloyd's to have his life underwritten there. The policies existing on this life at one time, it has been considered, could not be less than three or four hundred; it is hence evident that a death taking place, under such circumstances, would in the result of such inquiry appear as three or four hundred deaths, while in fact only one had happened. In like manner, the fact of the life still surviving would produce the anomalous result of there being 1000 or 2000 years of life, depending on the duration of these policies, without any recorded death. It is therefore clear, that unless the principle of repeated polices on the same life was uniform as to numbers, and very generally characteristic of the bulk of assurances effected, that compensation errors could not be expected to take place sufficient to render the results even a near approximation to the truth. So far, therefore, we are as yet without any satisfactory data, derived directly from Life Offices of this country, which can be relied on as indicating the rate of mortality among the assuring classes in recent years. On the Continent, however, we have been furnished with the experience of the Gotha Life Office; and in this instance the results are free from the objections just alluded to, as the investigation has been conducted on the number of lives, and not on the number of policies. The experience of the Gotha Life Office shows this remarkable and peculiar feature in the rate of mortality to which the members are subject. At the younger ages the mortality is much less than that indicated by any of the other tables yet alluded to; but at the older ages the rate of mortality is very much greater. At present it is difficult, if not impossible, to account for this peculiarity. Whether it be due to the different circumstances and habits of life of our continental neighbours, or whether it arises from some mutation in the physical condition of the assuring classes in recent years, and is common to our own country, it is difficult to say; for we have no sufficient amount of data relating to the last twenty years, within which the facts of the Gotha Life Office are limited: but that some such explanation may be possible is supported by a valuable body of facts made known to the public within the last few days. Professor Gill, the actuary of the Mutual Life Assurance Company, of New York, and with whose presence we are on this occasion honoured, has recently reported on the rate of mortality among the members of that Society, during the eight years which had elapsed from its establishment, until February 1851; and although the experience is not so extensive as that of the Gotha Life Office, still it embraces between 17,000 and 18,000 years of life, and is therefore valuable and curious, as showing the same peculiar features in the rate of mortality described as characteristic of the Gotha Company's experience,—only at the older ages the mortality is even higher than that of the other. It would be certainly of great importance to the interest of Life Offices to determine accurately, whether this be a prominent feature of the mortality prevailing generally, not only in this country, but elsewhere, among the assuring classes; and I do hope that the fact of so numerous a meeting of the representatives of Life Offices of this country being assembled here this day, to meet their distinguished brethren from the continent of Europe, and from America, argues well in favour of an effort being made, at no distant date, to collect and convey in an intelligible and satisfactory manner the experience of the different Assurance Companies, for the benefit of one and all.

"The frequent interchange of opinions, in meetings like the present, cannot fail to allay all petty jealousy of rivalship, and give birth to that praiseworthy emulation so beneficial in some other professions by which individual knowledge and experience is accumulated for the common good; and therefore I cannot help thinking, that however we may at present regret the imperfect knowledge we possess of the true value of the risks undertaken by Life Offices, we cannot but blame ourselves if that ignorance is permitted to continue much longer. Each in his own sphere can do much to urge the necessity of instituting these inquiries, and the force of such appeals must ultimately prevail. It should however not be lost sight of, that the rapid extension of the practice of Life Assurance of late years will render the data derived from the past experience of Life Offices yearly less applicable to their future operations. Hitherto, Life Assurance has to a great extent been confined to the comparatively wealthy; but now the practice seems to extend to the less wealthy and humbler classes, and is in fact almost universally recognised by the industrious workmen of the country in connection with Friendly Societies. As I have before stated here, it seems to me that there is little chance of a future generation of the gigantic Corporations, boasting of their millions of invested capital, and revenues exceeding those of some of the states of Europe, springing up. It is more likely that an intermediate class of Companies will be called into existence, holding a position between that of the great corporate bodies established in the last and early in the present century, and the humble Friendly Society, with which the working classes are familiar. If this supposition be well founded, or if it be admitted that Life Assurance will rapidly extend itself among all classes of the people, it is evident that the rate of mortality among the assuring classes must gradually approximate to that of the country generally. No principle in statistics is better established than the widely-differing rates of mortality among different classes and ranks of society; and the more assurances are confined to individual classes, the more peculiar ought we to expect the rate of mortality to be: but as the practice of assuring ramifies itself among all classes, so also will the rate of mortality gradually assimilate to that of the country at large. There is, consequently, reason to conclude that, with the extension of Life Assurance, the rate of mortality of life will become more favourable. In support of this statement there is the most abundant evidence. The past experience of Life Offices, as far as it can be made available in the solution of such a question, shows that the rate of mortality among the assuring classes, which chiefly belong to the middle and upper walks of life, is greater than that of the population at large. The corrected experience of the Government male annuitants also shows a higher rate of mortality; and taking the results of observations on the Peerage as given by Mr. Edmonds and Dr. Guy, the rate of mortality among the highest ranks of society is very much greater than that of the whole population of this country. It will likewise, I have no doubt, be admitted that among the intemperate, the destitute and debased, the rate of mortality must also exceed the average for the people at large. Hence, since all these groups experience a rate of mortality above the average of the whole population, there must be somewhere among the people a class which is subject to less than the average mortality. That class, it is evident from the exhaustive enumeration of the above groups, must be the industrious provident workmen of the country, who do not fall within any of the sections of the people spoken of.

"But there is, besides, direct evidence to show that the prudential portion of the working classes are really subject to a less rate of mortality. Early in this century, considerable attention was given to the nature of Friendly Societies or Sickness Clubs; and since the year 1824, the question of the sickness and mortality to which the members are subject has also engaged public attention: while, since 1835, some evidence of the rate of mortality prevailing among those Societies has been before the country; and for the last five or six years the most conclusive evidence, established on a large body of facts, showing that the duration of life among the members of Friendly Societies generally is much greater than that of the country at large, or the select classes dealing with Assurance Companies. Additional evidence is also being brought under attention in support of the same conclusion. This immunity from disease among the humble and industrious workmen of the country, whose prudential habits are sufficiently strong to maintain them members of these clubs, is only what *à priori* might be expected. The fact of continuing a member of such a society presupposes great regularity of habits; otherwise difficulties in circumstances and distress would ensue, and, from inability to continue his subscription, non-membership follow. Hence, such a member must be regarded as the type of industry, frugality, regularity of habits, and simplicity of life. The health of the body must co-exist with uniform physical exercise. The member's avocations enjoin on him a diurnal repetition of the different functions of the body, in a manner not required of the pampered, the indolent, the intemperate, and the debased. He has therefore his legitimate reward, in the enjoyment of a long, a useful, and let us hope a happy and blessed life. If the operations of Life Assurance Companies should ever extend so as to embrace the classes now comprising the Friendly Societies, it is evident that the rate of mortality must diminish rather than increase; but should the practice of assuring lives stop short of that, it is still obvious that the same principle will hold good, although the improvement in health may not increase to the same extent.

"Having dwelt at so much length on the nature and extent of the data now chiefly in use for the purpose of Life Assurance, I shall be unable to enter into detail on the immense field in vital statistics which still remains uncultivated. One of the most obvious, which still remains untouched so far as the middle and wealthier classes are concerned, is the mortality of children. Private monographs I know exist on this question, but are not available for public use. Connected with the mortality of children the following are questions of urgent importance to the Actuary not only in the more ordinary exercise of his functions, but also in the special cases on which his advice is frequently sought by the public:—The influence of age at marriage on the fruitfulness of the marriage. The influence of age at marriage on the mortality of the children born therefrom. The influence of age at marriage on the sex of the issue, and also on the relative mortality of the first, second, and third born, as well as each subsequent birth in consecutive order. The probability of marriage in different ranks of life for each age and sex is also important to be determined. But one of the questions in which the Actuary should be most interested, and for which he is but indifferently prepared at present, is that of the tests which should be applied to members seeking admission into an Assurance Society. The very mention of this subject opens up to our view a most fertile field of inquiry yet remaining untouched. Among more obvious questions may be mentioned the power of diseases, usually called hereditary, in developing themselves in succeeding generations of families in which they have once appeared. The relation of mortality in general in one generation to that in the next generation. Relation of the mortality in one section of a family to that of another or surviving section of a family. The probability of the development of infantile and other non-recurrent diseases in relation to age. The influence of infantile diseases on the mortality of survivors to mature life. The practical importance of the preceding questions must be evident to those of even the most limited experience. At present nothing but arbitrary tests exist, and consequently all the absurdities of caprice, instability, and prejudice interpose in the place which should be occupied by the science, judgment, and disciplined skill of the Actuary. To obtain this amount of new data will involve great expense, much labour and patience: still abundant materials exist to afford the information required, and all that is needed is a resolute attempt to conquer the difficulties, but it is too much to expect that private individuals can afford to go to the expense of collecting materials for the purpose of enriching public Companies already plethoric in wealth, and whose speculations have been notoriously profitable in the history of trading enterprise. The proper parties to bear the expense are the Companies themselves, and if the members now assembled would take the matter earnestly up, there is no doubt their united efforts would have the desired effect. A few thousands out of the millions possessed by the Assurance Companies devoted to the acquisition of accurate data on the subjects discussed, would form one of the wisest and best investments which any financier could devise, and place their Actuaries in the proper position of having to deal with facts and established principles instead of the dogmas of prejudice and ignorance. I cannot conclude these abrupt and extemporaneous remarks without stating my conviction, that one of the best means of improving our knowledge from the best sources, is by the cultivation of a high tone of honest and liberal manly feeling among ourselves, and the exercise of kindly offices to each other; by which the free communication of individual experience and knowlege will be made for the benefit of all, the promotion of our common interests, and the elevation of our status among other enlightened and learned professions."

Dr. Friedländer considered that though information on the subject of the data applicable to Assurance in various branches might be obtained in other countries, it would not be useful to employ it in this, so different were the results arising from habits of life, from circumstances of social condition, and from locality. As to Mr. Neison's question, what works had been published in Germany to throw light on these topics, he believed that Mr. Hoffman, of Berlin, would be found a safe guide to the Vital Statistics of Prussia. He was himself rather a sceptic on statistical facts, considering the ill-use which was frequently made of them; but he was disposed to consider Hoffman would be as trustworthy as any. Dieterici, his successor in the Statistical Bureau, at Berlin, was also highly valued on the Continent. In general theories the work of Moser was unsurpassed. The Lebensdauer of Casper might be in some respects more doubtful, but he gives a succinct and valuable account of the early writers, Dr. Halley and others. Dr. Friedländer then entered into an explanation of some of the novel inquiries which Casper had commenced; and instanced amongst others his conclusions, that the more prolific the marriages in a country were, the greater was the rate of mortality prevailing amongst the children of those marriages; that in cases where the wife was older than the husband, the marriages were less prolific; that in the mature marriage ages, such as where the wife was about 20 years of age and the husband about 30, the greatest number of children were born to each marriage, and that the average life of the children was longer. He apologised for any accidental errors in these statements, they being drawn from memory, but would refer to these works, as containing much curious information. He stated also that the work of Bernouilli, in Switzerland, was held of considerable value.

The Chairman having invited further observations, and waited a short time, said:—"Gentlemen, as our time is so valuable, and the second question is of even more general interest than the first, I will, with your permission, request your Vice-President, Mr. Thomson, who has given much attention to the subject, to favour us by introducing it. It is as follows:—

'What is the mean rate of interest prevailing, and likely to prevail hereafter, in this Country and on the Continent?'"

Mr. Thomson observed: That he considered the rate of interest at this time of more importance even than that of mortality. A small difference in the former would be found to be of greater consequence in a period of years by the accumulation at compound interest. He had taken considerable pains to gather some observations on the subject, to which his attention was first drawn by an investigation which he had been called upon to make into the Scottish Ministers' Widows' Fund. He had formed the results into a diagram, of which he was happy to lay on the table several copies for the use of the Meeting. In this would be found the variations of interest amongst the Banks in Scotland, and also a general summary of those great public events in each year which might be supposed to exercise an influence over the value of capital. It would be noticed that as a general rule the Banks took the lead in every change, and that landed security followed the Banks, rather than the Public Funds. In Scotland they had regular meetings of persons who were interested in fixing the value of money, composed of the principal solicitors and others engaged in finding means for large investments of money; and thus a similar rate obtained at different periods over the whole country. It might be expected that he should draw some conclusions from the past as to what the future rate might be. The subject might be difficult, but his own impression was that 3½ per cent. would be too high a rate to calculate upon in future; that 3 per cent. would be the best and safest; and that, from all his previous inquiries, he believed that the rate of interest would gradually diminish for many years to come.

Mr. W. S. Jones, Trustee and Director of the Equitable Life Assurance Society, said: That one of the questions before the meeting was, "What rate of interest of money would be likely to prevail hereafter in this country and on the continent?" He had not paid sufficient attention to this subject to be able to give a decided opinion; but as the history of the great Society with which he was connected might throw some light on it, he begged to make a few observations respecting the interest on their mortgages. Some years ago, in every mortgage deed the rate of 5 per cent. was required; but the Society having been called upon by external circumstances to reduce the rate, his attention had been called to the facts. At that time many thousand pounds of the interest remained unpaid long after the time it was due; and as in such societies the regular payment of interest was of the utmost importance to secure the full increase of their investments, a scale was drawn up, by which a certain reduction was allowed if the amount due was paid within 60 days. This brought in all the outstanding arrears,—only one stood out. After another change of a similar kind, a regulation was framed by which the interest paid by the mortgagors was regulated by a scale which varied according to the different prices of the public funds, but the average of which kept up the rate of interest about ½ more than that which could be obtained in Government Stock. This system continued for many years, and enabled them not merely to secure the very best mortgages, but to obtain the interest with a degree of regularity, which the Actuaries would know must be of great importance in the operation of compound interest. An alteration had since been made, and money was now only advanced at 4 per cent. for 5 years certain; after which it fell within the regulations previously described. The money was advanced nominally at 5 per cent., but the mortgagors trusted to the honourable fulfilment of the conditions, and the Society had no difficulty in investing all they required. They had now £4,200,000 on mortgage of purely landed property, with a margin of two, and in some cases three times the market value for their security. The question of what the future rate of interest might be, was a more difficult one. He would leave it for those present who had made the subject their study.

Mr. Pinckard said: That with respect to the rate of interest likely to prevail hereafter, he considered that it is more likely to *diminish*, than to be equal to or greater than has hitherto prevailed. Peace in Europe, which appears likely now to continue, must have that tendency; the importation of unusually large quantities of gold will have the same effect. Free trade, and the increased facilities and rapidity of communication, will increase wealth, and thereby make money more abundant. The increase of trade in Australia has had the effect of lowering the rate of interest. He was acquainted with a Company that could a few years since easily obtain, on the *best security*, in that colony ten or twelve per cent.; that high rate can no longer be obtained, and the rate of interest there is gradually becoming lower. Then as to the effect of the rapidity of communication, it has enabled persons engaged in trade, particularly the retail trades, to carry them on with smaller stocks, and consequently with less capital. This of course lets loose a certain amount, which must also tend to make money more plentiful, and thereby reduce its value. Consols having nearly reached par, he had recently heard, that in the event of the Funds going *above par*, Government would quickly make an attempt to reduce the interest: this again bears in the same direction of diminishing the rate of interest for the future. As respects the rate which an Assurance Office should employ, either in the construction of its tables, or in its valuations, he was clearly and strongly of opinion that 3½ per cent. is the highest rate that can with any degree of prudence be used. He considered that if an Office could realize on the sums actually invested 4, or at most 4¼ per cent., it was as much as any Society with a large capital to manage could do with safety. The following considerations prove that a serious drawback must occur in every Office. First, there is a large sum always in the hands of the agents and bankers which pays no interest. Secondly, there is always some interest in arrear, which from its not being paid at the time it was due, cannot be invested so as to carry on the compound interest properly. Thirdly, there are certain law expenses to get in the interest due, besides the loss of capital, which sometimes occurs by a bad investment. All these contingencies, if properly looked into, must have the effect of so reducing the rate as to leave but little if anything above 3 per cent. for actual accumulation. He must therefore come to the conclusion that it is imprudent, if not unsafe, to employ a higher rate than 3 per cent. at the general valuations, more particularly as such valuations should have reference as to what will be safe for the next thirty or forty years to come.

Mr. Lodge, in reply to Mr. Pinckard, remarked: That the small sums set free by the growing facilities of intercommunication were as nothing in comparison with the immense amount of capital likely to be absorbed by trade with new regions; that balances, for instance, now no longer required to be held by branch firms at home, would be employed in distant commercial enterprises; and that the development of the resources of America would alone give profitable employment for all the surplus capital of Europe for years to come. Hence he concluded that the tendency of affairs was to an equalization of interest throughout the world, rather than to a fall in the rate of interest in England.

M. Santhagens, of Amsterdam, observed: "The second question is, 'What is the mean rate of interest prevailing, or likely to prevail hereafter, in this country and on the Continent?' The mean rate of interest prevailing in my country is 4 per cent., this rate being the basis whereupon the Government of the Netherlands admits the Table of Annuities. But the same Government admits another basis for those Companies established in Europe, with branches in the Colonies, where the mean rate of interest is calculated at 6 per cent. The Company under my direction at Amsterdam, who prepared their tables according to that rate of interest, were authorized by the Government after a statement from the Minister for the Colonies, that the mean rate of interest in Java was 6 per cent. As for the future, the mean rate of interest is likely to decrease. I believe the remedy against that evil will be to establish a general office in the Colonies, to profit by the higher rate of interest in those countries, or to reassure the annuities which cannot be granted without some such measure. Those Companies who have branches in the Colonies may thus be able to lay out the capital sums paid for the purchase of annuities at a higher rate of interest than in Europe."

Mr. Hodge considered that the difference perceptible between various rates of interest at the same period, arose from the difference in the value of the security in which it was invested. A part of the rate might be considered real interest, the remainder as implying the degree of doubt whether the capital would be returned. In former times interest was remarkably high. It was not till the period of Henry VIII, that it was fixed at 10 per cent., and of James I, at 8 per cent. Money-lenders were looked upon with aversion and contempt. Usury was not as it now is considered, merely the charging of excessive rates of interest, but the taking any interest at all. Even our immortal bard had made the subject of one of his plays the odious character in which a money-lender was considered. Such opprobrium must be paid for, and this would in some degree account for the high rates formerly prevailing. In Queen Anne's time, the legal rate was finally settled at 5 per cent. Mr. Babbage gives an interesting comparison of the average rates prevailing during 48 years of war, and 44 years of peace, the former being 4 per cent., and the latter 3½ per cent. A great portion of the periods in which the latter rate prevailed was during the administration of Sir Robert Walpole. Notwithstanding, therefore, the enormous increase of population, no very material increase had taken place in the rates of interest. He considered that it might appear strange that the interests on landed security should be higher than in the funds, considering the numberless circumstances which might affect the tenure of the latter. He further remarked that the interest of money depends not only on capital, but on the demand for it. It may vary from so many causes, that it would not be safe for assurers to take the highest rate, but rather the lowest they would be likely to obtain. He called to mind that, as regards the United States, Dr. Franklin, in one of his admirable Essays, reminds his readers that a payment of a groat a day may obtain £100. to assist him in business, which is equal to about 6 per cent. interest. Capital must then have been comparatively scarce. It was nearly at the same rate now. Miss Martineau says that at Mobile, the prevailing rate was recently 8 per cent. At Massachusetts he believed it was 6 per cent. America, therefore, though she had increased so rapidly in wealth and capital, still required more. Increase of capital does not necessarily imply increase in the rate of interest.

The Chairman, finding that it was not possible to continue the discussion on this topic further, and understanding that some gentlemen from abroad had one or two subjects of interest to produce to the meeting, invited their observations on the questions.

M. Flemmick, of Antwerp, rose and said:—"Gentlemen, aware of the great advantages connected with a general system of communication to promote and facilitate a thorough knowledge of Assurance business, we feel ourselves thankfully bound to the gentlemen who are managers of the Institute of Actuaries, for their noble efforts, and for their calling together the present assembly of persons deeply interested in all questions relative to assurances in their different branches. Whilst Life Assurances are carried on with rates previously prepared, and the principles of which are recognised, the valuation of Marine and Fire Assurances must depend on circumstances and considerations liable to change at every moment. It may, therefore, be desirable, that in regard to them, every information should be obtained about all matters which may influence the consideration of such risks, and which may protect and benefit and add to the security of all parties concerned. With the desire of enlarging the means of approaching to such results, and being most specially interested in the line of Marine Assurances, my friend, M. Santhagens, here present, representing the underwriters at Amsterdam, has joined me in my similar capacity as representative of the Marine Assurance Companies at Antwerp, to suggest for your consideration the following proposal:—'That a Committee of Managers of the London Marine Assurance Companies be constituted, for the purpose of arranging a correspondence with the establishments abroad, or their representatives, with the object—1. Of putting a check on the constant occurrence of duplicate assurances. 2. Of devising the means of making public the rates of premium to be regulated by the special stipulations of the policies in different countries. 3. Of treating the question, so as to arrive at a general rule for all nations, in what manner war-risks may be considered and regulated.'"

M. Flemmick then handed in an important paper, in French, on the subject to which such a Committee might usefully devote their attention,—on the abuses at present prevailing in Maritime Assurances, and the remedies which might be suggested; but which could only be carried out by the cordial cooperation of all parties concerned. (This paper will be found in Appendix A.)

M. Lazarus, of Hamburg, Agent-General of the Assicurazioni Generali, in Trieste, then desired, in the following statement, to draw the attention of the meeting to the important question of assurances by the State:—

"Gentlemen,—Although the Institute of Actuaries has hitherto examined principally the questions alluding to Life Assurance, I hope to be excused for bringing forward an object of general interest for insurers, and I solicit the favour of your considering its importance. I shall be short. It will be doubtless known to the Institute of Actuaries that on the Continent the plan to make Assurance an affair of Government has often been tried; the Government undertaking to pay all claims and raising the necessary premiums in form of a tax. This plan was very lately proposed in France and Belgium. It will be superfluous to add one word about the dangers to which it gives rise. It would be equally perilous for the State, for the assured, and for the office. I think nobody here will venture to deny that such would be the result. I do not intend to discuss even the question how far the law, enforced in some of the German States, that buildings must be insured against fire in what is called 'Stats-brand-cassen,' in which the Insurance is granted by Government, and an *equal* premium raised for all risks, might prove to be a bad one. I have only to state that very lately in the Duchies of Parma and Modena, insurance against hail and fire risks has been taken up by the Government, and that the Companies have been forced to withdraw from these States, as they were from those of the Pope a few years ago, although they had many policies in force. It is possible that this example will find imitators who may desire thereby to increase the revenues of the Government; and I think all Insurance offices, and all who take an interest in the prosperity of the assured, and of the offices, should unite in a vigorous opposition to these schemes. Where could I better make this proposal, than before this Institute of Actuaries, before those gentlemen who are the most competent judges of the case? I add no more to recommend my proposal. I hope it will find no objectors."

The Hon. Secretary laid before the meeting some copies of a paper just received from Herr Masius, of Leipzig, prepared and printed expressly for this meeting, containing a summary of the present condition of the Assurance interests in Germany, in all branches of the business—Maritime, Life, Reversions, and Annuities, Fire, and the Transport of Goods, for which the thanks of the meeting were especially offered to this distinguished writer. (A translation of this paper will be found in Appendix B.)

A paper was also presented by Mr. Samuel Brown, one of the Honorary Secretaries of the Institute, on the various collections of data in the different branches of Assurance (Appendix C.), and a general summary of the Assurance business of Great Britain and the Continent. (Appendix D.)

From the interesting character of the discussion, it was evident that the meeting might have been continued for a much longer period, but the proceedings were obliged to be terminated, in order to allow opportunity for those who were present to arrive at Richmond in time for the banquet at 6 o'clock.

THE DINNER AT RICHMOND.

At the hour just named, the members of the Institute and their distinguished foreign and other visitors sat down to a dinner at the Castle Hotel, Richmond. The Right Hon. Lord Overstone, President of the Statistical Society, in the chair.

The foreign guests were, M. Aulit, Antwerp; M. Breton; M. Claparède, Geneva; M. Delahaye, Antwerp; M. Dubroca, Paris; M. Flemmick, Antwerp; Dr. Friedländer, St. Petersburgh; M. Gaultier, Lyons; Professor Gill, New York; M. Gueyraud, Marseilles; M. Guerry, Paris; M. Joliat, Paris; Mr. Kennedy, United States; M. le Cap^e Lafond, Paris; M. Kohler; M. Lazarus, Antwerp; M. Löwengard, Frankfort; M. Maas, Paris; M. Santhagens, Amsterdam; Herr Varentrapp, Aix-la-Chapelle.

Among the English guests invited by the Institute, were Colonel Sykes, Dr. Babington, Dr. Guy, Dr. Southwood Smith, Mr. Babbage, Mr. Chadwick, Mr. Childers, M.P., Mr. Clayton, Mr. Davies, Mr. Delane, Mr. Fletcher, Mr. Hendriks, Mr. Farr, Mr. Heywood, M.P., Mr. W. S. Jones, Mr. Lumley, Mr. Moriarty, Mr. Oswald, and Mr. Tidd Pratt.

After the usual loyal toasts, which were introduced by the Chairman with peculiar felicity and propriety, and were received with great enthusiasm by the assembled guests,

The Chairman proceeded to propose the toast of the evening. He said, in undertaking that task he could not but feel painfully embarrassed by the consciousness of his own incompetence to discharge the duty assigned to him. Fortunately, however, he was not responsible for the choice that had been made of the individual who presided over the meeting. With him rested the simple duty of doing the best he could to promote the pleasure of the meeting, and to forward the purpose for which it was assembled. In endeavouring to discharge that duty they must not expect from him any lengthened or eloquent address. He had no great public principle to submit to them for which it would be his duty to excite their enthusiasm; he had no appeal to make to their tender feelings, with the view of exciting their sympathy for the sufferings of humanity, or of calling forth their generous exertions for its relief. His simple task was to propose as a toast the prosperity of an Institution which he seriously believed was calculated to render good service to society, and which was supported by the exertions of a body of individuals who applied their time and their high intelligence to what he could not but consider was the appropriate, and he would even go so far as to say, was the appointed duty and mission of man upon earth. They might ask what he meant by that expression. His reply was simple and distinct. They, the body of Actuaries, as he understood it, were engaged in endeavouring to investigate the varied and complicated phenomena of the active life which surrounded them, and especially so far as they had reference to the casualties, often miscalled accidents, which affected them in their persons and properties; and their object was, out of the surrounding and apparent confusion, to deduce, if possible, something like order and regularity, and from their views of that order and regularity to arrive at some knowledge of the laws by which that apparent confusion was regulated, and to found regulations and institutions which should contribute to the safety of society, to the progress of the best interests of mankind, and to the advancement of civilization. Such, as he understood, when comprehensively worked out, and truly estimated, was the nature of the exertions made by the body of Actuaries, and the objects to which they were directed; and he would ask them seriously to consider what but that was the object of all knowledge? What but that was the end and aim of all those sciences which man cultivated at the cost of so much painful labour and thought, and for their effectual progress in which mankind in all ages of the world had received so large a share of approbation? They were all directed to the very same purpose—to the eliminating of order and regularity out of the confusion which apparently surrounded them, to the ascertaining the laws by which the events and the phenomena around them were governed, for the purpose of deriving from an accurate knowledge of those laws the means of governing those events and phenomena, of turning them to the use of man, and of rendering them subservient to his progressive improvement. In that respect the contemplation of the vast and varied phenomena of the universe around them was something like looking at those invisible writings with which they were occasionally amused. At the first view all was blank, but when the proper means and appliances were resorted to, they soon began to see the first indications of lines and traces, and after a patient investigation they began to find that what at first sight presented only a blank, was marked with some deep lesson of wisdom, or with some kindly message of love. So it was with the phenomena of nature. Take them in what sense they would, look at them with a superficial and with a hasty and uninstructed eye, and they conveyed no idea of benefit to man; but look at them more carefully and attentively, and they would soon find that if men would undergo the painful operation of investigating them with the faculties that had been given to them, they were full of instruction, of utility, and of benevolence. Look at the crust of the globe on which they trod. Could anything at first sight be more confused, disorderly, or irregular? *Rudis indigestaque moles.* Yet they knew, by a little patient study and investigation, that even there was order and regularity. They had discovered that the strata of the earth had been laid layer upon layer in the succession of ages; and when they had once been enabled to understand their order, they had ascertained the means of guarding against many fatal errors. Thus they found out the science of geology, and all the advantages and blessings which have been derived from it. Again, what could be more irregular and disheartening than the aspect of the uncultivated desert? and yet, by investigating the laws by which the productive domain of nature was regulated, they had been enabled to make it subservient to their very best interests, and that which before, when uncultivated, produced nothing, was made to pour forth immeasurable stores destined for the support, the luxury, and the comfort of man. Turn their eyes again from the earth below to the skies above. Look at the star-spangled vault of heaven. Anything at first view could not be less intelligible, or less instructive to man. Yet they knew what had been the result of their endeavours to ascertain the laws by which its system was regulated. Thus they had been enabled to discover the laws of astronomy, and from that discovery they knew what multiplied advantages had accrued. They were enabled to track their course on the pathless ocean, and after wandering for months and years upon its bosom, without sight of land, to direct their steps to some peaceful haven. Look again at the storms which convulsed the very bottom of the deep, or the winds and tempests that ruffled and agitated its surface. What to an ordinary observer could appear more unmanageable? Yet they knew that they had brought even them into their subjection; and thus the ocean currents were made the means of wafting their merchandise to distant climes—yea, even the law of storms itself had become the subject of the sternest investigation, and it was not difficult to believe that the time would come when the mariner would be able to steer his course along the very outskirts of the storm. Those were instances of their endeavours to elicit order and regularity from the apparent confusion in the material world. Turn again to the intellectual world. What could be more irregular than its manifestations? What could be more apparently the result of accident that could never be understood? And yet these, properly studied, might still be reduced to order. The laws by which they were governed might be ascertained; for what did they mean by prudence, by judgment, by wisdom, but the result of man having studied the apparent irregularities and the wild and frantic actions of his fellow-men, and of his having arrived at a knowledge of the laws by which they were regulated, and by the possession of that knowledge guiding himself though their tempestuous manifestations? The value of the study of the laws which regulated all the human phenomena that surrounded them, with the view of ascertaining the course they were likely to take, and the results that were likely to ensue from ascertaining those laws, had been expressed by a great English writer, in language so beautiful that, with their permission, he would venture to read it:—"Of law there can be a no less analogy than that her seat is the bosom of God, her voice the harmony of order. All things in heaven and earth do her homage. The very least is feeling her care, the very greatest is not exempted from her operation. Both angels and men, and creatures of what condition soever, each in a different sort and manner, yet all with a uniform consent, admire her as the mother of their peace and joy."

He had ventured to make those observations because he thought they bore directly on the subject in relation to which they were assembled that evening. They, the Actuaries of this country, were pursuing objects and purposes, and proceeding on principles precisely analogous to those of the votaries of science of every character. In that great sphere of human interests with which they were concerned, they were wandering among elements which for ages appeared characterized by interminable confusion; they were eliciting the order which really prevailed among them, and endeavouring to ascertain the laws by which they were regulated: and in proportion as they ascertained correctly those laws, they were obtaining the means by which they would prepare for society a measure of insight into those operations in which her highest interests were deeply concerned. They were enabling her to take a large portion of human action out of the category of accident, and to reduce to a certainty what had been looked on as a lottery or a game of chance; and they were enabling man, in his domestic affairs, and in the affairs which nearly concerned all his private happiness and morality, to steer a course as clear, as certain, and as well ascertained, amid the casualties of life, as the mariner of whom he had already spoken did amid the casualties of the ocean. And could there be an object more worthy of all the intellectual faculties of man, when measured in its direct bearing on all the best interests of society, or more entitled to their respect? It was on those grounds that he (the Chairman) felt deeply honoured at having been asked to preside on that occasion. He did feel that the pursuits of them, the body of Actuaries, were those in which society at large was deeply interested. The whole science of probabilities—for a science, in the justest sense of the word, it was—was one of the advanced marks of a very advanced and an advancing period of civilization; and so long as they took an interest in such investigations, and in those results which should be obtained from them, they would bring benefit to themselves, and happiness and peace to the world. The noble lord concluded by proposing "The Institute of Actuaries."

The toast was drunk with enthusiasm.

The Chairman then proposed "The Assurance Interests of the world." He said an increase of insurance in all its forms was one of the most certain indications of an advanced and a very advancing state of civilization. In that respect, other countries in the world were pressing most closely on our heels, and, in many respects, were far in advance of us. It was one of the peculiar characteristics of that peaceful rivalry, that they might look at the comparative success of their rivals, without wishing to detract from the benefits they enjoyed. With regard to France, for example, he was happy to say that the extent of insurances against fire in that country exceeded those of this country by 50 per cent. Most sincerely did he hope that that large amount of insurances, indicating the existence of circumspection, prudence, and some of the greatest virtues in society, might rapidly increase in that country to an extent to which he would place no limits, and that the same glorious symptoms of increasing morality might advance in this country at the same pace. Insurance was also largely extended and extending through Germany, in the United States, and in every country that pretended to be advancing in everything of which mankind ought to be proud.

The toast was drunk with acclamation.

M. Maas, in returning thanks on behalf of the Insurance Companies of France, said, a few years ago, men engaged in the same pursuits were envious of each other, and endeavoured to conceal all that could afford any improvement to their competitors. The English people, moved by a nobler spirit, did not fear to exhibit to all mankind the treasures of their industry, so that any one might profit by their example, and derive advantage from imitating them. The same feeling induced the Institute of Actuaries to convene the Actuaries of all nations on the native ground of assurance, to participate in the discoveries of their science, and the results of their experience. Many, many thanks to them for that good idea. He was happy to be able to express to them his gratitude, and regretted only that he could not do it in better language. He would add his earnest hope that there might be a perpetual union of science and industry between all civilized nations, and particularly between France and England.

Herr Varrentrapp, as the representative of a German office, and Dr. Friedländer, Professor of Mathematics at St. Petersburgh, also returned thanks.

Mr. Kennedy, on behalf of the United States, said that he represented in that country a youthful nation, hardly yet out of the leading strings of its parent, to whom it owed all honour and respect. They were hardly yet out of their swaddling clothes, and perhaps, like other children, they were rather fond of boasting, even in the presence of their parent; but he asked the company to attribute their faults to their youth, and to remember that their extraordinary natural growth, brought about by circumstances which neither they nor any other human power could control, had increased them in numbers and prosperity beyond anything that history could parallel. There was nothing peculiarly great, or glorious, or honourable, in the causes producing this state of affairs. Their greatest efforts had been directed to know themselves, and they were the first nation that had ever made the numbering of the people at the outset a part of their constitutional and fundamental laws. They had found that principle of so much value, that they had branched into co-relative subjects of inquiry. As early as 1810, the statistics of their agriculture and of their manufactures had been taken, it being considered that, next to knowing the numbers of the people, it was necessary to know their various conditions, in order that legislation might be carried on with enlightened views, and the progress of the country accurately ascertained. From that time till the present they had kept these objects in view, and in their last census, in which he had the honour to participate as superintendent, the age, sex, colour, condition, birthplace, trade, degree of education, of every being, white, black, free or slave, were given. The details of their agriculture, manufactures, and commerce were collected, and presented results deeply interesting to a society like this. With reference to the statistics of longevity, they had viewed with great interest the progress which the Actuaries of England had made, and instead of retarding them in their progress, they were willing to help them along and to proceed at the same rate themselves, if not a little faster. For himself, he had come far to receive information, and from "Farr" he had received it.

Mr. Neison then rose, and proposed the health of the noble Chairman in the following words:—

"My Lord,—I feel that an apology is due to the present company for my inability to do justice to the toast with which I am intrusted, and I therefore wish the duty had devolved on some one more competent than myself. The Members of the Institute of Actuaries have certainly reason to be proud of the distinguished honour conferred upon them by your Lordship presiding at this meeting. The fact of a nobleman so distinguished throughout Europe as your Lordship in economic science, and in the principles which regulate the monetary affairs of life, lending his countenance and support to the objects and purposes of the Institute, cannot fail to raise it in the estimation of society, and stimulate the Members to increased efforts in the study and advancement of the difficult and complicated scientific and practical questions which it is the purpose of the Society to promote. Your Lordship has so happily and so accurately described the duties and functions of the Actuary, that little more is necessary to be said on that subject; but I hope I may be excused if I trespass on your attention in taking advantage of the present occasion to remark, that in the opinion of many the office of the Actuary is confined to the precincts of the Life Office. This would be placing a narrow boundary to his functions; for exterior to the affairs of Assurance Companies, the public has long demanded his services in the regulation of some of the most important monetary transactions I trust it is not too much to say that an extension of the same principles which have been applied so beneficially to life contingencies, may reasonably be expected before long to be made to bear on the management of even our national system of finance. The business of some of the gigantic corporations with which Actuaries are connected is of equal magnitude with that of some European states, but it is in many respects much more complicated, requiring considerable forethought, judgment, and experience; and it may be fairly said that if in our national finances equal care were taken to systematize the management, and to evoke principles and laws from past experience to be applied in aid and guidance of the future, that much of the difficulty connected with the budget and taxation of the country would be avoided, and perhaps even some of its periodical financial calamities occasionally averted, or, at all events, their severity lessened. Where so many and diversified moral and physical causes prevail on the financial resources of the kingdom, it is not too much to say that there is at the present time as fair a prospect of deducing laws and principles, indicative of the limitations within which such monetary changes and fluctuations are confined, as there appeared to be some years ago to determine what are now recognized as important laws in the development of crime,—one of the most difficult of the moral class of actions to reduce to statistical tests; or as there was to determine the probable duration of life,—being one of the most complicated physical problems brought within the dominion of statistics. If this supposition be well founded, the functions of the Actuary may before the lapse of many years be more importantly recognized in connection with national finance. I do hope, therefore, from the affinity which the proper investigation of such questions must necessarily have to the inquiries which are professionally made by the Actuary, that the Institute may yet, among the other advantages which it is calculated to confer, be also the means of throwing considerable light on the economic principles which should govern our financial system. We trust, my Lord, that having, at this our first public meeting, been so fortunate as to receive your Lordship's approval and sanction, we shall experience as brilliant a course of prosperity as a kindred institution, the Statistical Society, in the formation of which your Lordship took an important part. It is therefore now my duty to express to this meeting the sense of the deep obligation and gratitude felt by every one of the Members of the Institute of Actuaries, for your Lordship's kindness in presiding at the present meeting, and thereby lending your high authority to the promotion of those branches of knowledge with which their professional labours are identified. Gentlemen, I beg to propose the health of our noble Chairman, Lord Overstone."

The toast having been enthusiastically responded to, his Lordship acknowledged the compliment with evident sincerity of feeling.

Mr. Peter Hardy, of the London Assurance Corporation, said:—

"My Lord and Gentlemen,—The toast which I have the honour to propose is one which, I am convinced, will be received with every kindness: 'Success to the Assurance Companies of Scotland!' My Lord, I am particularly happy in being permitted to propose this toast, because it gives me the opportunity of acknowledging, as an individual member of the community of English Actuaries, how very largely we are indebted to the Actuaries of Scotland for the ready and valuable assistance which they afforded us while yet our Institute was in its infancy, and for the steady good faith with which they have adhered to and supported us on every possible occasion. My Lord, you have this evening assured us,—and I, for one, have listened to that assurance with delight,—that you felt a pride in presiding over us on this occasion, because you felt confident that our Institute was not based on selfish motives. My Lord, I can conscientiously assure you, that our Institution was not originated in any feeling of professional selfishness. Its founders, one of whom I had the honour to be, took no counsel together how to narrow the access to our profession, or how to exclude other competitors than ourselves from a fair share of its honours or its emoluments. It was originated with a higher, and far nobler motive,—in the honest hope of educating the future Actuary, of improving amongst ourselves our present theories, and of enlarging the bounds of that science on which the safety of so many millions sterling depends, and in which the social happiness of so many thousand families is involved; and, my Lord, it is, I firmly believe, because our Institute is truly that which at its outset it professed to be—is truly that which I have endeavoured to describe it, that it has always had the warm encouragement and firm support of our Northern brethren. My Lord, having in mind the purport of this toast, namely, to do honour to the Assurance Companies of Scotland, I should indeed be wanting in common gratitude,—wanting in respect to the other members of my profession, did I resume my seat without making some allusion to an event which is yet fresh in the recollection of us all; which is filled with pleasant memories and recollections of graceful kindness and hospitality. It is exactly twelve months since a large body of the English Actuaries visited the ancient metropolis of Scotland, on the invitation of our Scottish brothers; and I need not tell you that our welcome was all that might have been anticipated from our knowledge of the ancient Scottish character. My Lord, the Assurance Offices of Scotland are this evening represented by two gentlemen, ranking amongst the most eminent of our Actuaries, and certainly two of the most active of the friendly spirits who ministered to us in Scotland. Both are so well known to us, that nothing that I can say can at all add to the esteem in which they are held, both in their professional and in their private characters. Mr. William Thomas Thomson, of the Standard, and Mr. Gilbert Finlay, of the Edinburgh. Mr. Thomson is one of our Vice-Presidents, and a large and valuable contributor to the transactions of the Institute. To Mr. Finlay, those who were of the English deputation to Scotland are particularly and gratefully indebted. Not satisfied with joining in the kindly hospitalities which were shown to us in Edinburgh, he, at much personal inconvenience to himself, accompanied us in our little Highland tour; nor ceased he from his friendly attentions until he saw us fairly started by the train on our return to England. If Mr. Finlay's memory be as good as mine is, he will recall, and I hope with pleasure, the few joyous days which we passed in 'the land of the mountain and the flood;' and I can, in all honesty and truth, promise him that every kindly sentiment which was breathed amongst us 'while at our feet Loch Katrine rolled,' will find its echo here on the winding shores of time-honoured Thames."

Mr. G. F. Finlay briefly and suitably acknowledged the compliment paid to the Scotch Offices.

M. Dubroca proposed "The Assurance Companies of England" in the following words:—

"My Lord et Messieurs,—Permettez moi de vous assurer combien je suis fier d'avoir été appelé à l'honneur de porter au nom des étrangers un toast à la prospérité des Compagnies Anglaises. Il y a longtemps qu'on a dit, Messieurs, qu'il est un langage universel, ne connaissant point de nationalité ni de frontière, c'est le langage du cœur! Que mes paroles prononcées en Francais soient l'écho des sentiments qui nous animent quand nous buvons à la prospérité des Compagnies Anglaises. Ce toast, Messieurs, sera recueilli avec d'autant plus d'enthousiasme, par cette assemblée toute entière, que la prospérité des Compagnies d'Assurances se lie étroitement à celle du pays. C'est une source de gloire et de richesse nationale que cette grande institution des Assurances dont je vois autour de moi les plus illustres représentants: soit qu'étendant sa garantie aux milliers de vaisseaux qu'abrite votre pavillon, elle donne au commerce un élan et une sécurité complets pour l'échange de ses produits avec l'Univers; soit qu'en réparant les désastres de l'incendie, elle aide de sa main puissante à l'érection de ces grands établissements industriels qui font l'honneur de l'Angleterre et l'une des gloires de cette exposition qui attire le monde entier autour d'elle; soit enfin dans une autre sphère moins voyante mais plus étendue encore, qu'elle aille prendre par la main tous les enfans du pays, donnant par les assurances sur la vie, aux riches les moyens de parer aux désastres d'un changement de fortune; aux pauvres les moyens d'arriver à l'aisance et à la richesse par l'épargne; à tous les sentiments et les joies de la famille. N'avais je pas raison, Messieurs, de dire en commençant que la prospérité des Assurances Anglaises est une gloire nationale, gloire que nous célébrons aujourd'hui; donc je suis fier, je le répéte, d'être en ce moment l'interprète au nom des étrangers qui, dans la sincerité de leur enthousiasme, s'écrient avec moi du fond du cœur, Honneur aux Assurances Anglaises! Trois fois honneur à l'Angleterre!" (Much cheering.)

Mr. W. S. Jones, in responding to the toast, said, the Equitable Assurance Society, of which he was a Trustee and Director, was the second Company of that kind which was formed in this country. The first Society established itself on principles which were not to be continued for any length of time. It took the same rate of premium for every interval of age, which it was speedily found would not answer. The Equitable Society was established 1762; and, from that time to the present, it had gone on those principles of computation, which all the Actuaries in England now acknowledged to be the best that could be adopted. It was founded especially for the benefit of the families of persons who were assured in it; and since its foundation it had distributed £26,000,000 among the persons who had been connected with the institution, whilst the Society had also accumulated a sum of nearly £9,000,000, which was to be appropriated partly among those persons who were now insured in the office, and partly amongst those who might join it afterwards. He had devoted himself to the interests of Life Assurance for nearly fifty years; and he could say that the great Company with which he was connected had been carried on with perfect honour and propriety. He believed that the Institute of Actuaries had only recently come so prominently before the notice of the world; but he considered that it was a Society of the greatest value, both to the public and its own members. He rejoiced that they were thus devoting themselves to the important subjects of their studies with zeal and energy, and he heartily wished them prosperity and success.

The Chairman next gave "The Statistical Society," which was responded to by Colonel Sykes in the following terms:—

"My Lord and Gentlemen,—I cannot but acknowledge feeling myself much gratified by having my name associated with the Statistical Society and Statistics, a science, without the aid of which legislation is only a series of tentatives, of probabilities, and political experiments. I feel, however, that I owe the compliment you pay me rather to my long zealous co-operation with the Statistical Society, than to any efficient aid I may have rendered to statistics. It would have been my wish, so called upon my legs, to have said something respecting the past and present condition and prospects of statistics, but my physical weakness disables me from any lengthened exertion, and I must, therefore, confine my observations within narrow limits. Although statistics have received only comparatively recent attention in Great Britain, they are not new to other nations. In the library of the Royal Asiatic Society, there are statistics of the Chinese Empire of more than 2000 years' date. David, when he numbered the Jews, must have had some idea of statistics. There are in the library of the Statistical Society of London, seven folio volumes in manuscript of the statistics of France in Louis the Fourteenth's time; they have every appearance of being original documents, and were probably brought over from France by some of the employés at the Revocation of the Edict of Nantz. The Spaniards, also, have their Dictionario Statistico. England commenced recently, and, considering the character of the nation, it is surprising that statistics should have made not only slow progress, but that occasional discredit is thrown upon the science. The latter may be attributed to more than one cause,—the dishonest use of garbled statistics, or even the honest use of statistics founded upon data not properly verified; in either case the deductions may militate against truth, and prove mischievous. A mere array of figures, supposed to represent facts, and from which normal conditions are drawn, does not constitute legitimate statistics. In the first place, the length of time over which the facts run may be insufficient to justify normal conditions or laws; and in the next place, the facts themselves may be influenced by social or physical causes, operating for several years consecutively, and then ceasing. There is an illustration of this within my own experience. For four or five successive years, the troops serving in Scinde experienced a sickness and mortality very considerably exceeding that of the troops serving out of the province of Scinde. The facts appeared sufficiently persistent to establish normal conditions, and I got my friend Mr. Neison to calculate the value of life at different ages in Scinde, as compared with the value of that of troops elsewhere. He was kind enough to do so; and no actuary could have safely ventured to insure life in Scinde at the same premium as lives out of Scinde. Nevertheless, local circumstances produced the supposed normal conditions. The troops for those four or five years had lived in tents, had slept upon the earth, had been harassed by marchings, and the supplies of food were neither so regular nor so good as under ordinary circumstances. For several years past the troops have been cantoned, they have not lived in tents, and have had their comforts about them, and the health of the troops for years past has been as good as the health of the troops out of Scinde. The statistics of the first five years were bad, and did not exhibit normal conditions. [Colonel Sykes gave other instances.] With respect to the misuse of statistics, an instance occurred the other day in a debate in the House of Lords. It was asserted that the export tonnage of Great Britain had fallen off last year, and it was to be attributed to the abolition of the navigation laws. It was quite true that the tonnage had fallen off during a part of the year; but supposing the falling off had continued throughout the year, and for two or three succeeding years, the time would not be sufficient to establish statistical normal conditions, and justify the argument used. But it so happened that one of the opponents in the debate knew that a great ship builder had doubled his tonnage during the last year, and another, who had said he must leave the country in case the navigation laws were abolished, was as busily employed as ever. The argument, therefore, founded upon statistical facts, proved a fallacy. I take a great liberty in making these observations before the Institute of Actuaries, who are not likely to want caution in the selection of the facts they handle; but I have thought it necessary to make them, to account for some of the distrust with which statistics are received, and for the want of that progress which statistics ought to have made in this country. Gentlemen, I thank you in the name of the Statistical Society for the honor you have done the Society, and for coupling my name with it."

Mr. Farr then rose and said:—"I have to propose to you as our next toast, 'The President and Officers of the Institute of Actuaries.' The task is at once agreeable and difficult: agreeable, because I have to express a sentiment which is participated in by us all; and difficult, because I feel how incapable I am of giving the sentiment adequate expression. In reference to what has fallen from my friend, Mr. Kennedy, of the United States,—who has boasted of the achievements of his country, and of the sagacity displayed by her citizens in making the census a part of the fundamental law,—I readily admit that in this, as in other instances, America does not glory without cause. The census of 1850, so ably conceived by the Government, and so satisfactorily superintended by them—as well as the results of that census—merit our admiration, and may well be subjects of gratulation. England, perhaps from pride, rarely indulges in self-praise; but, without any infringement of this rule, she may claim credit for something. This island may fairly boast of having peopled and founded the flourishing States of North America. Other countries may be blest with a happier climate, a more fertile soil, more splendid flowers or fruits, a greater abundance of the precious metals, than this kingdom,—they may have larger armies, and have achieved more victories, or have produced as great or greater men; but no nation of ancient or modern times has ever established such colonies, or instituted anything to be compared to the United States of America, which number now twenty-one millions of people united in the enjoyment of free institutions, and animated by an energy which has carried them from the busy ports of the Atlantic to the shores of the Pacific,—thus completing the golden circuit of commerce round the world. I see but two dark spots on her banner—slavery and repudiation. But as both attach to particular states, rather than to the United States, they will, we may hope, soon disappear. Another thing for which England may fairly take credit is the having produced the first Life Table,—one of the greatest discoveries of the 17th century; and in its improved form, the basis of all the complicated operations of Life Insurance. As if to show, however, that there was something cosmopolitan in this great system of Insurance, the Life Table—which appeared in the Transactions of the Royal Society of London—was framed by Edmund Halley, from observations made at Breslau in Germany. Another Life Table, constructed on true principles, was made by Deparcieux, a Frenchman. Then we have the Carlisle Table, constructed by an English actuary,—one of the most eminent that has lived. That great man rests from his labours; but his work remains—a monument of skill, industry, accuracy, sound reasoning, liberal candour and truth. I cordially concur in the praise that has been bestowed on the great Insurance Companies; they have given the business a legitimate direction, and a great extent: but I cannot admit that they have done all of which they are capable to advance the science of Insurance, either against life, or fire, or sea risks. The Equitable and the Amicable Offices have set examples which should be followed extensively in all directions. And how or through what agency can this end be so well accomplished as through an institution like the Institute, of which we have assembled to celebrate the anniversary? I do think that the existence of such a body as the Actuaries of Great Britain is another of those things of which we may legitimately boast. I have said that facts, observations, and tables scientifically constructed, are indispensable; but these are not enough. The actuaries in great commercial establishments like our Offices for Insurance should be men of the highest integrity and honour; and these requirements they fulfil. Several of them are known to us all; and we can safely say, that more honourable men do not exist. To cultivate friendly feelings among those engaged in every kind of insurance—to stimulate the industry—to enhance the character of the body of actuaries—as I understand it—is the purpose which the officers of the Institute will keep steadily in view. And this is a great object. I look forward to the day when the profession of actuary will be greatly extended, and when no commercial concern of any extent will be without such an officer. Not only fires, shipwrecks, the accidents of life, may be foreseen and provided for by science, but every kind of commercial misadventure. Then those crises so destructive to the fortunes of the merchant will perhaps be of rarer occurrence; or if the storms and tempests do arise, their laws will be known, and many good ships that would otherwise founder, be brought by scientific hands safely home. I regret that, through the unavoidable absence of Mr. Sheriff Gordon, this toast has had no justice done it; but, looking to the names of the men, their aim as officers of the Institute, and to you, I know that it will receive a hearty response."

Mr. Jellicoe, in reply, said:—"My Lord and Gentlemen, it is much to be regretted that our excellent President, Mr. Finlaison, could not be here to-day to respond to this toast, more particularly as I have just learned that he will to-day exactly complete no less than forty-six years of service as chief of a great department of the Government of this country. It is some alleviation of our regret, however, to know that the severe illness with which he has been visited has taken a most favourable turn, and that there is now every reason to hope that he will shortly be restored to the performance of those duties which he has on every occasion discharged so much to the satisfaction of us all. To those, my Lord, who have laboured for the formation and success of this Institute, the presence of your Lordship here this day, and of the many eminent persons who surround you, cannot but be looked upon as a very gratifying circumstance; implying, as it does, a recognition of those principles which it has been their main object to establish. To your Lordship we are now indebted for such an exposition of those principles as has long been wanting, and as will no doubt leave an impression not easily effaced; and we have also very much to thank Mr. Farr, for bringing his powerful aid to throw further light upon them. In such investigations as those with which we have to do, the exclusively scientific man is most likely to err; and the merely practical one is almost sure to mislead. It is the Actuary alone, who, coming between them, and combining the knowledge of both, is by that means enabled to arrive at results calculated to be of real service to his fellow-men. As yet, my Lord, our Institute is but in its infancy; but I trust that what your Lordship and others have said on this occasion alone will convince those who have hitherto doubted of its real utility and importance; and induce them, as I earnestly hope, not to bate one jot of their labour till they have succeeded in raising up a school, in which not only the subjects alluded to this evening, but the cognate ones of taxation, currency, finance, and political economy generally, shall receive their fullest development; and by the dicta of which, as flowing from the purest reason, and the most accurate knowledge, the highest authorities of the realm shall find it their true interest to be guided. I will not detain your Lordship further, than to express my thanks on behalf of the President, Vice-Presidents, and Council; also on behalf of our two Honorary Secretaries, Mr. Robert Tucker and Mr. Samuel Brown, to whose great ability and untiring exertions I may, perhaps, be permitted to say, the Institute is indebted for very much of the success which it has hitherto attained."

Mr. J. Childers, M.P., in an eloquent speech proposed "the Press," and Dr. Guy, "Medical Statistics."

The latter toast was appropriately responded to by Dr. Babington, who bore testimony to the great importance, and indeed the absolute necessity, of an accurate knowledge of medical statistics in order to the successful prosecution of the business of Life Insurance. He observed that the welfare of Insurance Offices, and of the public as connected with them, mainly depended upon the advice which they received from their medical officers, and that the knowledge of these officers was derived from a careful study of health and disease in the individual, and also of the more general laws which regulated disease in the aggregate: that the former was the fruit of personal experience, and what was called medical practice; the latter of the careful study and application of medical statistics. From the above considerations, he warned the directors of Insurance Offices against the error of choosing their medical advisers on account of their connections, or the recommendations that they might bring with them, or on any other ground whatever, except their knowledge of the business which they undertook to perform, seeing that they would do infinitely more harm by the admission of bad lives than they could possibly make amends for by any amount of patronage. He then alluded to the formation of the Epidemiological Society, of which he had the honour of being President, and expressed the hopes which he entertained, that through its labours much light would be thrown upon an obscure though very large class of diseases, which had a vast influence upon the duration of life, and consequently on the operation of Life Insurance Companies. He took the opportunity to express his thanks, and that of the body over which he presided, for the pecuniary assistance which several Insurance Offices had bestowed on the society, and ventured to recommend that so commendable an example should be followed by the rest. In conclusion, he expressed his obligation as a visitor to the Actuaries' Institute for the kind invitation they had given him to be present on this interesting occasion, and for the great hospitality with which he, in common with the other visitors, had been entertained.

This was the last toast; and thus ended an entertainment, which, served with great profusion and elegance, and varied by some excellent music and part-singing, appeared to give universal satisfaction.

[NOTE.—We regret that the length to which this Report has extended renders it impossible to insert in this Number the several papers referred to; they will, we hope, not fail to appear in our next.]

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